THE DENTAL PRACTITIONER

AND DENTAL RECORD

Including the Transactions of the British Society for the Study of Orthodontics, and the official reports of the British Society of Periodontology, the Glasgow Odontological Society, the Liverpool and District Odontological Society, the North Staffordshire Society of Dental Surgeons, the Odonto-chirurgical Society of Scotland, and the Dental and Medical Society for the Study of Hypnosis

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SMITH, J. A. K. (1949), *Brit. dent. J.*, **86**, 271.

LEWIS, R. W. B. (1947), *The Jaws and Teeth*, 2nd ed., 471. London: Science Publishing Co.

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THE DENTAL PRACTITIONER AND DENTAL RECORD

Vol. XI, No. 5 January, 1961

EDITORIAL

RESEARCH AND GENERAL PRACTICE

Dental Progress is the name of a new journal which will be welcomed by the profession because of its avowed intention to publish papers by research workers in such a way that the clinician may appreciate the purpose of their work in relation to everyday practice.

This is a noble ideal.

The very first paper published in the new *Dental Progress* has, however, proved exciting, upsetting the belief of half a century: that lactic acid is the chief demineralizer of teeth. Haldi, Wynn, and Law, two physiologists and a research technician of Emory University, who have together published more than fifty papers in the fields of nutrition, metabolism, caries, and tooth composition since they became a team in 1948, have shown that succinic acid is a far greater destructive agent of tooth structure than lactic acid. This surprising new fact demonstrates the need for more research into the effects of the dibasic acids normally found in the mouth and their role as precursors of caries.

Two other American research workers at the National Institute of Health have recently published a paper (Fitzgerald and Keyes) which some people are saying may also alter our outlook on dental caries causation. Keyes, a full-time dental research worker, has been studying experimental caries in animals for years. He has found that in experimental animals caries is a transmittable disease. Fitzgerald, a bacteriologist working in the same department, brought his specialist knowledge to bear on the problem. The result of Keyes and Fitzgerald's association is an interesting paper in a recent issue of the *Journal of the American Dental Association* describing the production of dental caries in previously caries-inactive rats by the inoculation into the oral cavity of a specific streptococcus. Fortunately, Fitzgerald is an expert in the management of bacteria-free rat colonies, and the combination of these two techniques promises to produce considerable progress in the bacteriological field in the next few years.

Both these reports may not, in themselves, be important, but they do, however, point up the value of specialists from other fields being employed in dental research. Who can tell where the next major breakthrough will occur in our battle against dental disease—most probably in those branches of dental science where the non-dental specialist can best interpret them. Maybe many significant observations will be missed unless suitably trained people are available to utilize them.

Once again the DENTAL PRACTITIONER stresses, as in its Editorial of last August, the importance of recruitment for dental research of workers from other scientific fields.

HALDI, J., WYNN, W., and LAW, M. L. (1960), "Enamel Demineralization", *Dent. Prog.*, **1**, 4.

FITZGERALD, R. J., and KEYES, P. H. (1960), "Demonstration of the Etiologic Role of Streptococci in Experimental Caries in the Hamster", *J. Amer. dent. Ass.*, **61**, 9.

NEW THOUGHTS ON COSTEN'S SYNDROME

By **FRANK COFFIN**, F.R.C.S., F.D.S.
Consultant Dental Surgeon, Royal Marsden Hospital and Royal Dental Hospital

THE cause of Costen's syndrome (1934) has been in doubt ever since it was first described, but recently a new conception of its cause has been put forward (Coffin, 1960) which differs from the usually accepted one. This paper is an enlargement and a more detailed consideration of that explanation.

Of all the pathological states of the temporomandibular joint, Costen's syndrome is the most common to present clinically and has been known by his name ever since 1934. It was probably first noted by Brown (1912). It is a relatively uncommon syndrome, but interested dental surgeons see it regularly and series of 500 cases have been published. Over the years the syndrome as elaborated by Costen has been examined in the light of experience and most of the auxiliary symptoms described by him have been separated off as being rarely found, leaving an entity which is fairly well defined and has come to be described as an arthrosis—a term first used by German authors because of its apparently idiopathic nature — in contradistinction to an arthritis, a condition of known pathology with antecedent infection, trauma, or disease process.

The patient is typically a young woman between the ages of 15 and 30 years, but mostly in the early twenties, and often of petite stature. The small features of these patients are often most striking and in particular the proportions of the face are altered, by which the lower third is reduced.

In the normal face the distance between the undersurface of the chin and the septum of the nose is about equal to that from the nose to the glabella and from the glabella to the hair line on the forehead. This division into approximate thirds is a very old observation.

In these patients the lower third is smaller than usual, a fact which is occasionally seen at first examination. If the patient is asked to open the teeth gradually while keeping the lips together, and having opened about 0·5–1 cm. she is asked to close the teeth together the deficiency is noted at the moment of closure much more readily than by trying to assess the size of the free-way space by looking at the teeth and occlusion.

EXAMINATION

During examination, the patient should be encouraged to point to the site of the pain with one finger only—as a rule they use the whole hand over the side of the face. One finger will define the area more closely.

Pressure of the examiner's fingers on the condyle of the opened mandible will elicit pain if the joint is the seat of the pain.

Examination Reveals.—

1. Pain and/or click in the affected joint. *The pain* is usually directly over the joint, but occasionally spreads over a wider area on that side of the face. Although occasionally severe, it is usually moderate in degree. *The click* accompanies the jump described in (2) and may occur on opening or closing, or both.

2. A moderate degree of trismus. On examination this is found to be due to restricted movement at one of the temporomandibular joints which causes a deviation of the chin to the affected side in early opening of the mouth, after which the chin jumps into the central position in later opening with a degree of reduced total opening, variable in each patient.

Some patients complain of grating noises in the ears on moving the joints, although it cannot be felt as such by the examining finger.

Most patients present with a marked overlapping of the upper incisor teeth over the lower ones.

Occasionally the condition is bilateral, usually at its worst on rising, getting better during the day.

A second group occurs, usually later in life, in patients who have lost molar teeth and have not had them replaced adequately. Costen's cases, described in his original article, appear to be in a third group of completely edentulous cases. These present similar joint symptoms to the other groups, but, in addition, very

occasionally have paræsthesia or pain in the lingual nerve on the same side. Costen in reporting his series gave his clinical facts correctly, but his deductions would appear to have been faulty. It is surprising that he got so many to report.

It should be remembered that signs or objective symptoms of peripheral nerve involvement (in the absence of a history of accidental or operative trauma) must be considered to be a sign of nerve involvement by disease of one sort or another and should be investigated as such at least concurrently with dental treatment if not before.

The sex distribution within these second and third groups appears to be equal.

Many large series of cases published seem to include patients who are suffering from: (*a*) Facial pain from other causes; (*b*) Trismus from other causes.

In patients complaining of facial pain one should suspect some condition other than this apparently idiopathic condition of the joint if the clinical findings do not fit into the age-group and conditions defined, and the whole head and neck region should be repeatedly examined by the dental surgeon, E.N.T. surgeon, and neurologist, for other lesions in their respective fields. A patient suffering from facial pain must not be labelled of neurotic personality except with the greatest reserve and must be subject to constant review. Usually an organic cause for the pain can be found, and the personality fault must not be allowed to obscure an adequate search for it.

AETIOLOGY

The cause is usually given as a retroposition of the mandibular condyle in the glenoid fossa due to the overclosure of the mandible consequent upon the "closed bite" or loss of molar support, thus stretching the capsule or pressing on the post-joint tissues by the condyle to cause pain, and the trismus is ascribed to reflex spasms of the muscles.

The structures in the bilaminar portion of the disk are very vascular and mobile to allow forward movement during opening. It would be reasonable to expect that such mobile tissue could suffer the compression that occurs with this small hypothetical retroposition without causing pain. If the incisor overlap is increased by as much as 2 mm. the movement back of the condyle would be less than 1 mm.

However, the aetiology has not been fully established, principally because so few cases come to operation that it is impossible to correlate the symptoms with joint appearances or histological changes. However, the retroposition of the condyle, if it occurs at all, must be so minimal that it lies within the normal range of movement, and, in fact, has been rarely, if ever, irrefutably demonstrated.

In the cases with loss of molar teeth the height of the bite is often maintained by premolars and canine teeth, so that it is difficult to see how the mandible can overclose and the condyle pass into the retroposition usually stated. In completely edentulous cases presenting with the pain, it is remarkable how often these patients tend to protrude their mandible, which offsets any retroposition due to overclosure. Patients who have recently had all their teeth removed have the greatest difficulty in approximating their edentulous gums and complain of soreness in the region of the joints, but the pain is very different from that of Costen's syndrome, only being present during attempts at overclosure and not over the full range of movement. It is not accompanied by clicks or gratings.

JOINT FUNCTION

In discussions of the movements of the jaw most accounts deal almost exclusively with the muscles above the lower border of the mandible.

The suprahyoid group, although occasionally mentioned, are not given adequate treatment, yet by the balance of these opening muscles with the closing muscles the rest position of the mandible is maintained, and retrusion takes place by the balanced active movement of both.

Electromyographic studies have been mostly confined to the closing muscles, and due to the deepness and close proximity of the medial and lateral pterygoid and temporal

muscle insertions their interpretations are equivocal.

Little has been said about the ligaments of the mandible, and yet these structures play an important part in the function of any joint; for instance the strong temporomandibular ligament probably restrains the condyle from passing backwards very effectively. How much the other ligaments control the movements has been little thought about.

Therefore the exact mechanism of joint function, together with the part of the fibrous intra-articular disk therein, is still a matter for discussion.

Suggestions as to the cause of this syndrome must be more or less conjectural, but review of the available data prompts this new conception of the disease process.

The available data come from:—

A. Signs and symptoms of patients.

B. The dissection in a fresh state of apparently asymptomatic joints from patients dying of other disease.

C. X-rays of normal and affected patients.

I shall then attempt:—

1. To correlate and explain the symptoms and signs of patients in the light of (*B*) and (*C*) and on general grounds.

2. To explain why treatment methods are successful, again in the light of (*A*) and (*B*) and on general grounds.

We have to explain the following clinical facts and symptoms obtained from over 150 cases.

A. **Clinical.**—

1. *Age-groups and Sex Variation.*—

Primary group: aged 15–30 years. Ten females to one male with a full dentition.

Second group: any age but usually over 40. Females = males, with loss of molar support.

Third group: completely edentulous with occasionally paræsthesia in their 5th nerve distribution. Males = females.

2. Given time the condition gets better whatever is done or not done. Until about 20 years ago the condition was hardly recognized. It therefore remained untreated and no permanent ill-effects are recorded.

B. **Post-mortem Studies of Forty-eight Joints.**—The first thing to notice is that in the cadaver only a pure hinge movement takes place on depressing the chin with the condyle remaining posteriorly in the glenoid fossa, in contradistinction to the forward movement of the condyle in the conscious subject on opening the mouth. In the anæsthetized patient also, no forward movement takes place. Therefore deductions as to the type of movement and in which compartment of the joint it takes place must be suspect when derived from the dissecting room.

The description of the joint and disk with two thicker mediolateral bands as described by Rees (1954) is accepted here as correct, but with reservations on his inferences about the movements for the above reasons. The disk would appear to be much less mobile than is usually thought, fitting the condylar head like a cowl, firmly attached at the medial and lateral sides, less firm posteriorly and loose in front. It forms a much more integral part of the joint than the menisci in the knees.

Soon after death, and presumably in life. the disk is far thinner and the joint space much smaller than one comes to expect from X-ray appearances. Twenty-one condyles out of the 48 showed typical naked-eye appearances of osteo-arthritis.

Blackwood (1959) in a very large series of 500 complete temporomandibular joints excised from the skull, in a much wider age range showed osteo-arthritic changes in 40 per cent, which is of interest in that the number of people of any age-group complaining of their joints is very small.

However, the cause of the pain in other joints about the body affected by osteo-arthritis is not understood and it is agreed that many joints undoubtedly affected by osteo-arthritis are not painful.

It may be thought that perhaps Costen's temporomandibular joints are in fact osteo-arthritic joints, but this is unlikely, first, because of the different age of the main group, and secondly because Costen's, when cured, recovered full range of movement, which osteo-arthritic joints do not. Thirdly, osteo-arthritis gets progressively worse, and the vast majority of Costen's improved.

C. **Radiography of the Joint.**—The temporomandibular joint is very difficult to project clear of other structures and to obtain standardized views. Special temporomandibular joint projections give only a limited lateral view of the condyle and this falls short of the basic requirements, when studying any joint, of at least two views at 90° to each other.

X-rays of the temporomandibular joint in various degrees of opening give no more information than a good clinical examination. They are therefore of no help in the condition, and rarely give indication of osteo-arthritic changes. Gross changes in the condyle and joint space associated with other conditions must be excluded, so that in clinical practice it is best to get straight lateral and postero-anterior views of the condyle, and to dispense with any special views of the joint.

Ciné films taken with the image intensifier give more information of the normal movements and show that *a distraction* of the joint occurs when biting on a firm morsel on the molar teeth.

This has been confirmed by Osborne (1959) and Brill and others (1959).

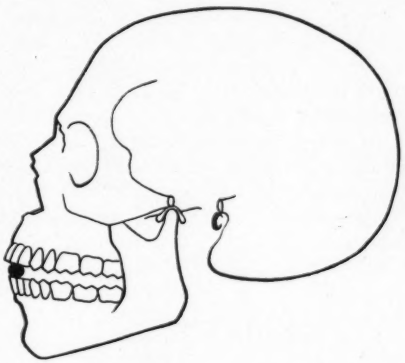

Fig. 1.—Biting on a firm bolus in the incisor region increases pain.

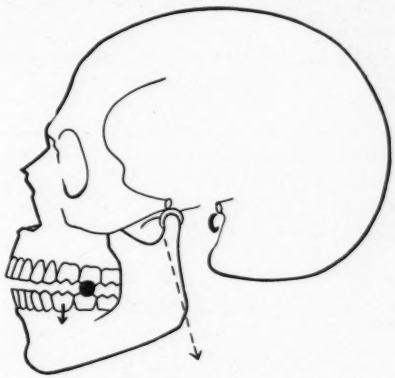

Fig. 2.—Biting on a firm bolus in the molar region stops or eases pain.

MORPHOLOGY

We see that the mandibular condyle and neck is much smaller than would be expected if the condyle is subjected to compressive forces all the time. Other bones have their weight-bearing joints in their thickest part. In the mandible this is the horizontal ramus and alveolus—the vertical ramus is but a thin blade for muscle attachment and the condyle would seem to serve for the most part as a guiding surface.

It is of interest that other joints in the body with intra-articular disks or menisci all probably undergo some distraction with active use.

Thus, in the usual process of eating, say, an apple, the jaw is protruded and the incisors bite the apple to separate off a bolus, probably imparting a momentary compression of the disk. The tongue then moves the bolus to the molar teeth to be crushed, which distracts the joints reducing the compression.

These findings form the basis of a clinical test of joint involvement when pain is the main complaint.

After opening the mouth the patient is asked to bite two firm cotton-wool rolls between the incisor teeth; this will cause the typical pain. If he now bites the same cotton-wool rolls between his molar teeth on the affected side, no pain or a diminished pain will be caused because he is distracting his joint (*Figs.* 1, 2).

The mechanism by which the joint is incapacitated can best be understood by first considering the second group, i.e., those

patients who have lost molar support, but who have retained the height of bite by premolars and canines.

Here the patient is unable to use the back teeth for biting, so is unable to distract his joint. He has to bite and chew on his anterior teeth, so compressing the disk between the condyle and the posterior slope of the eminentia where the condyle will be held longer than normally by the need to keep the incisor and canine teeth in contact, and therefore the mandible is protruded to do so. It is in this part of the range of movement that the joint would normally be distracted, with thus no pressure on the disk. Repeated unnatural pinching of the disk is likely to cause an inflammatory reaction therein, and therefore the joint disturbance.

When we come to the main primary group, i.e., those young patients with a full dentition but with a closed bite, we can explain the insufficient distraction by an inability to get sufficient leverage by reason of a faulty fulcrum in the posterior molar region or an overlong lever acting in the condylar region.

These factors can be obtained by slight irregularities in ossification of the jaws and skull. In point of fact, the very term "close bite" infers insufficient growth of the alveolar portions of the jaws, while the fact that these young patients occur when growth is ceasing and get better whatever is done or not done can only be explained by some process that is stopping naturally and correcting itself naturally.

It is generally agreed:—

A. That the mandible grows:—

1. In the length and height of vertical ramus from the condylar centre (Walker, 1957; Sicher, 1952).

2. In girth by appositional and periosteal bone.

3. That the alveolus grows *pari passu* with the eruption of teeth.

B. That the skull and its maxillofacial extensions are growing from many centres—sutural, chondral lines, together with appositional and periosteal deposition.

As a rule these all march in step and stop in step, so that the total articulation of the mandible (condyle and dental occlusion) with the skull (glenoid fossa and dental occlusion) is exactly congruous.

It is suggested here that occasionally *A* 1 continues longer than *A* 2 and *A* 3, thus increasing the height of the vertical ramus disproportionately. We know that this does occur in an extreme form in such cases as unilateral hyperplasia of the mandibular condyle, and that the body of the mandible will distort as compensation (Walker, 1957). Should this occur, then growth in the region of the tooth-bearing area has stopped and the jaw in its relation to the skull is, in the closed position, fixed precisely by the occlusion of the closed teeth. But the mandible is still being pushed downward by the continuing condylar growth, so separating the cheek teeth and propping the mandible on the condylar articulation.

In these circumstances on opening and closing the mouth the condyle will squeeze the fibrous disk between itself and the glenoid articular surface by virtue of the tension in the muscles of mastication. On biting on the cheek teeth the distractive force will have less effect than when the vertical ramus is of the normal height. Thus less than normal biting stress is taken on the dental occlusion and more than normal on the joint, particularly the fibrous disk.

This repeated pinching of the fibrous disk will cause inflammatory changes to occur in it and its synovial covering which may spread to the capsule. Œdema may also be caused in the fibrous layer of the perichondrium of the head.

Effects on Movement.—

Opening.—The œdema of the disk and synovial membrane reduces the joint space so that there is less room between the articular fossa and eminentia and condyle, thus reducing the mobility of disk and condyle. Looking at it in a different way, the condyle in coming forward will have to mount in effect a higher eminentia; thus it will stick at first until the tension in the relatively weak opening muscles is sufficient to overcome the obstruction, when the condyle will leap over it—possibly with a click. Dingman and Mormon (1951)

have described this happening in a joint exposed with local anæsthetic.

Return Path.—

Simple closure: The path is obstructed by the thickened disk, but as the closing muscles are strong it is easier to do; nevertheless the condyle will jerk back as tension rises, and sometimes with a click.

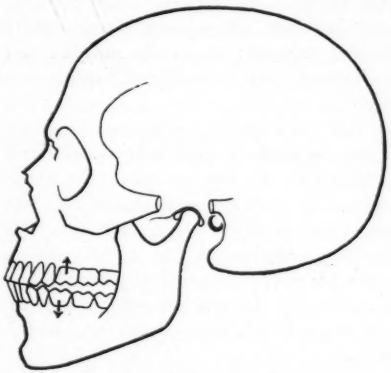

Fig. 3.—Reduced alveolar growth causes crushing of the disk by the normally growing condyle.

Biting.—

1. *Incisor.*—When biting on the incisor teeth with a normal joint the condyle is moving up the posterior slope of the eminentia and the jaw is protruded. Little pressure is exerted on the disk by reason of the angle which the axis of the condyle makes with the slope of the eminence, but where the disk is swollen the compression is greater in all segments of the range, and therefore movement is painful.

2. *Molar.*—On biting on something firm in the molar region the normal joint is distracted, and this will allow the condyles to pass backwards easily. On biting on the molar region with an affected joint the œdematous disk will obstruct the passage back of the head, in spite of the distraction, which will tend to click back with increased tension in the closing muscles.

On chewing, distraction decreases progressively as the bolus becomes smaller, so that pain increases.

It is reasonable to expect that this irregular tripping motion with sudden irregular increases and decreases in tension in the strong ligaments such as the stylomandibular, sphenomandibular, and pterygomandibular ligament may well cause pain away from the precise area of the joint. Also, an effusion into the joint will further decrease mobility. The general joint dysfunction may well produce a degree of spasm in the muscles of mastication, but this spasm is secondary to the joint dysfunction and not the primary condition as has been stated.

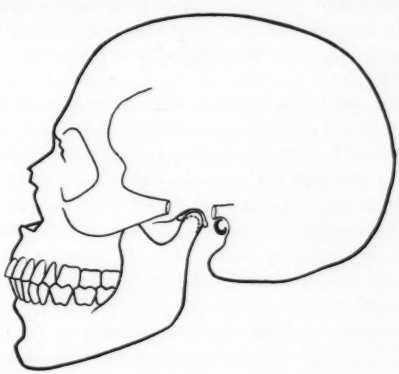

Fig. 4.—Continued condylar growth after normal alveolar growth causes crushing of the disk.

The loss of a smooth surface of the disk consequent on the inflammatory changes and perhaps a changed viscosity of the synovial fluid could account for the grating sensation *heard* but not felt in the ear.

It can be seen that this disparity between the height of the vertical ramus of the mandible and the height of the tooth-bearing portion can occur:—

1. If the mandibular and/or maxillary alveolus stop prematurely and the condyle grows normally, then the commonly associated "close bite" would accompany the painful joint. (Ballard, 1956, refers to this more correctly as an "open bite".) (*Fig.* 3.)

2. If the mandibular and maxillary alveolar growth proceeded normally, thus giving a normal height of bite, but then both stopped before the condylar centre, the syndrome would occur in the presence of a normal height of bite, a condition which sometimes presents (*Fig.* 4).

3. If the maxillary alveolus or the ossification of the base of the skull, sutural or chondral, stops before the mandibular centres, however much the latter are synchronous between themselves.

It is very likely that combinations of these disparities occur which cancel each other out, so explaining why every person with a closed bite at this age does not get the complaint.

In order to explain why so many more women are affected (primary group) it may be suggested that the earlier puberty of women gives less time for normal balance between the several components of facial growth to be attained. However, this is no more obscure than the feminine preponderance of hallux valgus or the male preponderance of baldness. There are, of course, many other diseases with an unexplained different sex incidence.

The eventual conclusion of all ossification, except the normal turn round of calcium salts, prevents progression of the disparity, after which the gradual modification of the dental occlusion by eruption and movement of the teeth within the alveolus and moulding of the jaw removes the amount of disparity present at final ossification. This very gradual movement is taking place all the time through life, after main growth has ceased.

Thus the primary condition is a self-limiting one, so the diagnosis of Costen's syndrome in a patient over 30 years of age should be very suspect unless he has lost tooth support, when by definition he comes into the secondary group.

It will be seen that this conception of the syndrome is that of a traumatic arthritis, or synovitis, the trauma being self-inflicted. Traumatic arthritis of the temporomandibular joint probably occurs with most fractures of the mandible, but the symptoms are masked by the pain of the fracture itself. However, an almost identical, but short-lived, clinical situation is an uncommon sequel to a difficult tooth extraction. The painful joint is on the opposite side to the affected tooth especially if an upper molar is concerned. It would appear that during the long period of instrumentation the jaw is deviated to the tooth side, bringing the opposite condyle forward and on to the eminentia and probably pinching the disk as before. If a lower molar is concerned, the affected joint is on the same side, if the jaw is insufficiently supported by the operator. The capsule and ligaments are then stretched, and perhaps torn, to cause pain.

Here, however, there is a history of the antecedent trauma; the pain may be very severe indeed, but gets better rapidly with rest only.

The rare third group consists of those cases who are edentulous and who have faulty dentures which do not maintain the correct separation of maxilla and mandible. The patients are more elderly than the other groups. In addition to the usual joint disturbance they very occasionally complain of tingling in the tongue of the same side, and, it is said, of other symptoms, such as tinnitus.

It should be noted that Costen's original cases were of this sort. His clinical findings have been doubted, as have his explanations of them, but as I have seen 3 cases—2 edentulous and 1 with absent molars—with lingual paræsthesia I am more inclined to accept the findings but to substitute another explanation for the nerve involvement.

Most edentulous patients, especially those with dentures which do not restore the normal height of bite, protrude their lower jaw a considerable distance, both during eating and between meal times as a habit, for considerable periods. It is suggested that this action causes traction on the inferior dental nerve, which is relatively fixed at the inferior dental canal, and as the 3rd division of V, at the foramen ovale.

Traction on nerves is well known to produce paræsthesia in their peripheral distribution. For example, the ulnar nerve may be stretched by increase of the carrying angle of the elbow due to trauma during the growing period. This results in paræsthesia along the inner side of the hand and forearm—later anæsthesia and wasting of muscles.

The lingual paræsthesia is relieved concurrently with the joint symptoms just as soon as dentures are provided, which allow of adequate

distraction and relieve the patients of the necessity to protrude their jaw.

Treatment for the Young People of the Primary Group.—The most popular method is to "raise the bite" by inserting a platform of acrylic resin between the occluding surfaces. This:—

1. Provides a platform so that the biting stress is taken on the teeth and muscular force is expended on the teeth producing the normal distraction of the joint on molar biting. To be effective the platform must not be so thick as to be uncomfortable in itself, and a rough guide in closed bites is to bring the incisor overlap to about one-third of the lower incisor crown length. It must be adjusted in the mouth very meticulously for it is commonly made far too thick, rendering it ineffective as the patient is unable to wear it at all. It must go as far back as possible in order to be in the best position to act as a fulcrum and get the greatest amount of distraction.

As soon as pain and trismus are relieved, usually within 2–3 weeks, the plate is ground away over one molar so as to encourage that tooth to erupt to take up the deficient height of bite. As soon as, but not before, it is in full occlusion, another tooth is freed to erupt, the process being progressively applied all the way round the mouth, making quite sure that each freed tooth is in full occlusion before proceeding to the next one. Eventually the plate is totally ground away and is discarded—a process which may need 2–3 years, or the time between first presenting and final closing of all growth centres.

2. In this inflamed condition of the joint, the patient reflexly tries to put the joint in the position of maximum ease. Just as the slightly inflamed hip joint is held in a position of slight flexion, abduction, and lateral rotation, so in the mandible this position is just out of dental occlusion and very slightly protruded so that the incisor teeth become somewhat more edge-to-edge.

But the occlusal surfaces of the premolars and molars are made up of a series of inclined planes which interdigitate very closely into a fixed central position. On closing the mouth from this slightly forward position of ease, the lower moving inclined planes are forced up the upper fixed ones by the biting muscles pushing the mandible and condyle back and up into the glenoid fossa, again pinching the disk. If the bite splint mentioned in (1) is provided with a smooth occlusal surface, this forward position of ease may be retained even in the fully closed position and thus helps the condition in this way. If the teeth have very high cusps, this locking of the inclined planes is very pronounced. When no close bite is present it is manifestly wrong to over-open the occlusion so that in these cases it is possible to grind the teeth so as to allow the forward position to be maintained in the fully closed position. It must be done carefully so as not to reduce the height of bite in the process. It should be noted that the cuspal interference is secondary to the joint disturbance, rather than the reverse, as is usually stated.

It seems to me unlikely that a disharmony of cusp relationship would cause inflammation in the joints even if they did come to rest in a slightly eccentric position, for these positions would nevertheless be within the normal range of positions in the joint and at a time when no power was being exerted on the joint as the jaws would then be in a fully closed position.

One might as well expect a series of joint complaints in the feet, ankles, knees, hips, or spines of young women from wearing the tremendous variation in shoes that fashion ordains and which undoubtedly causes these joints to be used in positions other than the normal but are nevertheless still within the normal range of movements.

Much more likely is the tooth, alveolus, or periodontal membrane likely to suffer a dysfunction, as it doubtless does. Indeed, it may be that in the primary group condylar growth disharmony may be manifest in some cases by a paradontal condition.

3. This grinding process is accompanied by injections of 2 c.c. of hydrocortisone, which probably acts by reducing œdema, inflammatory exudates, and inflammation in the joint structures—immediately making more room in the joint and easing the pain after 36–48 hours of preliminary soreness. If the condition is not near its natural conclusion the injections

may need to be repeated at intervals. Murdoch and Will (1959) discuss the changes that occur in the synovial fluid of joints treated with intra-articular steroid therapy.

4. Removal of the disk will of course remove the affected part of the joint, but the disk forms such an integral part of the joint that its loss would be expected to interfere with function. Those who practise the operation say it does not.

No cases in my series have been severe enough to warrant operative treatment of any kind beyond injection.

TREATMENT OF THE SECOND AND THIRD GROUPS

Provision of adequate dentures restoring the vertical height of bite to normal will invariably cure the joint disturbance, although they usually take longer to recover than the younger age-group and more often need initial hydrocortisone to help them. In fact, the longer the period over which the symptoms have been present before treatment the longer will the disturbance take to clear up.

SUMMARY

A new explanation of the cause of Costen's temporomandibular arthrosis is made which is more in accordance with orthopædic thought and accepted joint pathology than the usual dental one. Based on a concept of altered joint mechanics, caused, in most cases, by a slight growth disturbance with its subsequent effect on joint function, most of the clinical signs and symptoms of the syndrome are easily explained thereby, as is the absence of the syndrome in those cases where anatomically it might be expected.

Acknowledgements.—My thanks are due to Dr. J. J. Stevenson for making the image intensifier available, to Dr. Gowings for access to necropsies, and to the Editor of the *Journal of Laryngology* for the use of blocks.

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Mouth-cleaning Devices

The use of a team consisting of an industrial designer, a research worker, and a dentist to study methods of oral hygiene is in itself unusual. In this case the purpose was not to exploit or market a product for an industrial concern, but to examine the problem and from the findings to offer experimental designs. The aim being to demonstrate the value of co-operation between experts in different fields, and the need for designers to practise a more systematic attitude to designing.

The specification and design method that is given for developing a mouth-cleaning device is fully comprehensive. However, such an item as "find the nature and effect of harmful bacteria" (a problem which research workers have studied for years without coming to a definite conclusion) and the statement that "a full investigation of the subject would be detailed and extensive, though well within the capacity of a university research department backed by a manufacturer's development facilities", is perhaps unrealistic.

The new devices produced by the authors include a mouth spray, a disposable toothbrush with tooth paste, and a chewing device in hard rubber. The writers emphasize that both the actual methodology and the proposed designs are merely evocative and purely indications of what a systematic analysis of the subject might produce.—Archer, L. Bruce, Burnaston, John, and Grieves, John (1960), *Design*, **139**, 24.

J. N. Swallow

STUDIES IN THE DEVELOPMENT OF THE PERIODONTAL MEMBRANE

THE APICAL REGION OF THE ERUPTING TOOTH

By **J. D. ECCLES**, F.D.S. R.C.S.
School of Dentistry, The Queen's University of Belfast

INTRODUCTION

THE structure of the periodontal tissues around the growing apex of a tooth is of interest because of its relation to the problem of tooth eruption.

Sicher (1942a, b) investigated the apical region in the teeth of continuous growth in the rat, guinea-pig, and rabbit, and the teeth of limited growth in the dog, pig, and man. He described the tissues at the apical end of the erupting single-rooted tooth as forming two zones: (1) A layer of loose connective tissue next to the bone, containing, in the rat incisor, many large blood-vessels, and (2) A layer adjacent to the epithelial diaphragm of the sheath of Hertwig, closing the epithelial apical foramen and forming a strong hammock-like ligament, which at the sides emerges out of the fibres of the periodontal membrane. Many of the fibres, he states, can be traced into the bone; the ligament is, in fact, "anchored in the bone above the alveolar fundus". None of his photomicrographs shows this attachment—only a drawing which shows strong attachments to bone at the side of the socket just above the fundus. Because of fluid present between its fibres the ligament is also called the "cushioned hammock ligament".

Sicher considered that the ligament was essential for the eruption of single-rooted teeth. It changed the force of eruption, derived from proliferation of pulp tissue, from pressure on the base of the socket to tension on the walls of the socket, and thus prevented resorption of bone at the base of the socket. In multi-rooted teeth he found no hammock ligament and thought that their eruption was caused by bone growth at the bifurcation.

Scott (1953) also described the hammock ligament and considers that in multi-rooted teeth there is a hammock ligament beneath each of the roots during development and eruption. Both Sicher and Scott refer to it as the basal part of the dental follicle.

But there is not general agreement about the existence of a hammock ligament. Hunt (1959) found no hammock ligament in the guinea-pig molar, but described reticular fibres in the apical region as having the function of supporting the larger-walled blood-vessels and nerves. He found no collagen fibres.

Ness and Smale (1959) found no hammock ligament in the rabbit incisor, but observed, in silver stained sections, thick fibres running from the pulp to be attached to the base of the socket as an anchoring system. Little connexion was found between the basal fibres and the periodontal fibres at the side of the root.

In view of the differences in these findings it was decided to investigate the subject further.

MATERIALS AND METHODS

Five rats, 3 dogs, 2 cats, 1 guinea-pig, and 1 rabbit were obtained at ages when some of the teeth were actively erupting. In a few of the animals the vascular system was injected with Indian ink. Sections of teeth and adjacent structures were prepared and stained with Gomori's silver technique, hæmatoxylin and eosin, and Mallory's connective tissue stain. The dental follicles of tooth-germs and the apical regions of erupting teeth were examined.

In other specimens, dissections of the apical region of erupting teeth were examined with the aid of a dissecting microscope.

FINDINGS

Developing Tooth-germs.—

Histology.—In the permanent incisor germ of a 3-week-old dog, at the basal end of the follicle three layers are seen (*Fig.* 1).

(1) An outer zone of loose connective tissue next to the bone containing a vascular plexus

and with numerous fibroblasts and some collagen and reticular fibres. Most of these fibres run parallel to the bone of the crypt.

(2) A middle zone of very loose connective tissue containing much tissue fluid, few cells, and gradually fades out. Between this and the external enamel epithelium is a thin layer of fibroblasts.

The premolar germ of a 4-week-old cat (*Fig.* 2) is similar, except that the fibres of the

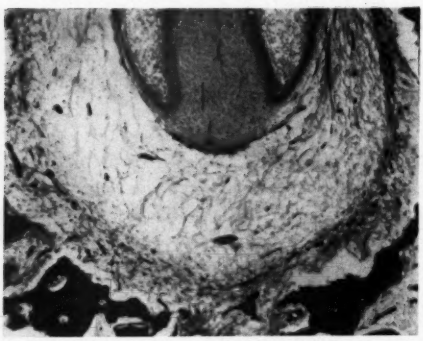

Fig. 1.—Tooth-germ of permanent incisor of 3-week-old dog. Mallory. (× 43.)

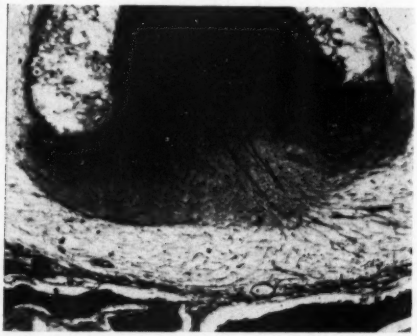

Fig. 2.—Tooth-germ of premolar of 4-week-old cat. Gomori. (× 43.)

Fig. 3.—Apical region of deciduous incisor of 3-week-old dog, injected with Indian ink. Mallory. (× 33.)

Fig. 4.—Apical region of deciduous molar root of 4-week-old cat. Gomori. (× 38.)

few fibres, and a few large blood-vessels. The fibres form a loose-meshed network.

(3) A very thin layer of collagen fibres crossing the apical foramen apparently separating the pulp from the middle zone. This layer also contains a vascular plexus. Laterally this layer extends along the side of the tooth-germ inner layer do not extend right across the apical foramen but are deficient in the centre, and here the pulp tissue merges directly with the middle zone.

Dissection.—The follicle has little attachment to the enamel of the crown, but after root formation begins it obtains attachment to the root and some effort is necessary to separate them. The follicle also has connexions with the pulp at the apical foramen.

Teeth of Limited Eruption.—

Single-rooted Teeth.—

Histology: The erupting deciduous incisors of a 3-week-old dog were examined (*Fig.* 3).

The apical region of these teeth is similar to that of the permanent tooth germ. The outer and inner zones are present, although less well defined. The inner zone consists of a thick sheet of collagen fibres lying close to the surface of the root. These fibres pass across the apical foramen, but as they do so turn upwards to become continuous with the fibres of the pulp. At the side of the root this sheet runs near the surface of the root to join the developing periodontal membrane. It can be seen to have no attachment to bone.

Dissection.—The apical region of the erupting incisors and canines of a cat and a dog were dissected. At the apical end of the pulp is a relatively avascular area through which the main blood-vessels pass with little branching or arborizing. The pulp tissue is inseparably attached to the sheet of fibrous tissue which runs along close to the surface of the root. This sheet is not attached to the tip of the root, but beyond this it has a definite connexion.

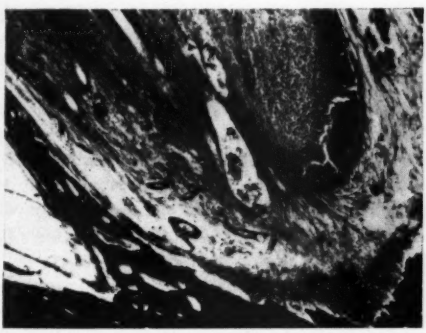

Fig. 6.—Apical region of guinea-pig incisor labial surface on right. Gomori. (× 25.)

Multi-rooted Teeth.—

Histology: In the rat molar, zones similar to those described above are seen. In the outer zone the vascular plexus is less well developed. At the apex the fibres of the inner zone run into the pulp or merge with those of the middle zone. Towards the crown this sheet either runs alongside the root to merge with the developing attachment apparatus or fades out before reaching this. It has no direct attachment to bone. In the deciduous molar of a cat (*Fig.* 4) the outer and middle zones are not clearly differentiated. The inner zone forms a thick sheet of fibres which cross the apical foramen and run into the pulp. This sheet has some

Fig. 5.—Apical region of 5-week-old rat incisor which had been erupting unopposed for 2 weeks. Gomori. (× 55.)

Fig. 7.—Part of apical region of rabbit molar. Gomori. (× 28.)

attachment to the bone and to some extent resembles a hammock ligament, but its connexions with the tooth are stronger than those with the bone.

Teeth of Continuous Eruption.—

Incisors.—

Histology: In the guinea-pig incisor (*Fig.* 5) the outer zone is present on the labial side and contains a vascular plexus, but elsewhere it is indefinite or absent. The middle zone is again present only on the labial side. Apically,

numerous reticular fibres emerge from the pulp and spread out towards the bone.

On the lingual side there is a dense sheet of collagen fibres on the surface of the root which appears to be attached to it by finer fibres. There are a number of fibre bundles running

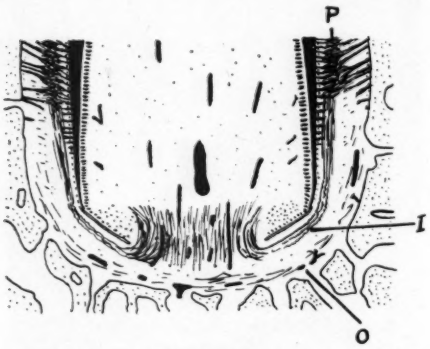

Fig. 8.—Drawing of the apical region of typical tooth of limited growth. P = Intermediate plexus; I = Inner Zone; O = Outer Zone.

from the bone to this sheet, but the fibres are not continuous with those of the sheet. These bundles run from the bone with an obliquity towards the incisal part, that is, in a direction opposite to that in which a hammock ligament would be expected to run.

In the rat incisor (*Fig.* 6) the outer zone forms a dense network at the region of the fundus. It contains no vascular plexus. As in the guinea-pig, reticular fibres run axially from the pulp and spread out in the apical region towards the bone. On the lingual side the fibres are arranged as in the guinea-pig incisor.

Cheek Teeth.—

Histology: These teeth have a single root, but are divided into several units, each unit having a pulp chamber. These pulp chambers meet at the basal end so that there is a common apical foramen.

In the rabbit molar (*Fig.* 7) the outer zone is narrow and has a vascular plexus. The middle zone is wide and contains numerous tissue spaces and a number of larger blood-vessels.

The inner zone forms a sheet across the common apical foramen separating the pulp from the middle zone in some sections, but in others the inner zone appears to be absent from this region. It is constantly present along the side of the root to which it is loosely attached. It runs up to the region of the developing periodontal membrane where it is eventually joined by fibre bundles from the bone, but these fibres do not appear to be continuous with those of the sheet. The guinea-pig molar is similar to that of the rabbit.

SUMMARY OF FINDINGS

In all the teeth and tooth-germs examined fibrous tissue is present in the apical region. In some cases this is divisible into three zones, called here the outer, middle, and inner zones, but in others the middle zone is absent.

The outer zone, lying next to the bone, contains numerous fibroblasts and reticular and collagen fibres arranged mainly parallel to the surface of the bone and having weak connexions with it. Usually it contains a vascular plexus (*Fig.* 8).

The middle zone consists of less dense fibrous tissue with many tissue fluid spaces. Through it large blood-vessels run to the pulp and the periodontal membrane. Laterally, it extends along the periodontal space beside the root, until it is replaced by the developing periodontal fibres. In some teeth, notably continuously erupting incisors, reticulin fibres run axially out of the pulp through the apical foramen and across the middle zone towards the bone, with weak attachment to it.

An inner zone is nearly always present in the form of a sheet of fibres, lying close to the tip of the root and the epithelial diaphragm. Sometimes this sheet is very thin and occasionally it is absent. These fibres sometimes appear to extend right across the apical foramen, but usually this appearance is present only in sections cut through the periphery of the apical foramen. More centrally, these fibres do not run across as a continuous sheet but run into the pulp so that there is close continuity between this sheet and the pulp. In dissections the two are difficult to separate.

The inner zone is closely adapted to the surface of the root. By dissection it is possible to separate it without much difficulty from the

tip of the root, but farther up the root the attachment is much stronger. This attachment is due to fibre bundles which are connected to the cementum of the root and join the inner zone. Farther still from the tip of the root the inner zone is joined by fibre bundles from the bone, and becomes replaced by the intermediate plexus of the periodontal membrane where the tooth fibres and the alveolar fibres intermingle.

DISCUSSION AND CONCLUSIONS

The findings of this investigation show that the periapical tissue in erupting teeth is derived from the basal region of the dental follicle as described by Scott (1953) and by Sicher (1942a, b). It usually differentiates into three zones—outer, middle, and inner—which are similar in different animals and at different stages of development.

It is difficult to accept that the inner zone can act as a hammock ligament as described by Sicher because its primary attachment is to the surface of the root and its fibres are not directly attached to bone. It is frequently thin and does not always form a sheet across the apical end. The inner zone has close continuity with the fibrous tissue of the pulp.

It does seem possible that the three layers together may act as a cushion against which the proliferating pulp expands during the process of eruption.

The only significant difference between the various types of teeth examined appears to be the presence in continuously erupting incisors of reticular fibres which run from the pulp towards the bone having loose connexions with it. This has been described by Ness and Smale (1959) as an anchoring system. It is probably connected with the much greater rate of eruption in these teeth.

Acknowledgements.—I wish to thank Dr. James Scott for his help and advice, Mr. S. McKearney for technical assistance, and Mr. G. Bryan for the photomicrographs.

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Pigmented Mole in Oral Mucosa

Occurrence.—These moles are common in the skin where melanin is normally produced and its production is increased in coloured people and in disease, e.g., Addison's disease. They have been known to occur in most of the mucous membranes of the body, including the mouth where 90 per cent appear in the palate and alveolar process of the upper jaw. Excision is usually recommended because of the danger of malignancy.

Case Report.—A male patient, aged 60 years, presented for denture service, and clinical examination revealed a pea-sized tumour on the hard palate in the region of the first premolar and 5 mm. from the ridge. It was firm, the same colour as its environment, and there was no involvement of the lymphatics or the underlying bone.

Histology.—The excised tumour was fixed in formalin, embedded in paraffin, and sectioned. The slides were stained with Van Gieson's stain, hæmatoxylin and eosin, and impregnated according to Masson. Staining for iron pigment was negative. Microscopic examination showed a fairly cellular tumour in the lamina propria. The nævus cells, arranged in dense streaks separated by thin collagenous connective tissue bands, were of uniform size with regular nuclei and no mitoses; various parts showed large quantities of melanin. There was no stroma reaction, and near the base parts of the tumour had undergone hyalinization. Near the surface the tumour was separated from a highly differentiated, cornified squamous epithelium by a thin zone of connective tissue. The epithelium showed insignificant basal pigmentation, and there were no intra-epithelial nævus formations.—Bjorlin, G., and Bergman, F. (1960), *J. dent. Ass. S. Afr.*, **15**, 52.

G. E. B. Moore

BUCCAL TONSIL

By J. M. GORMAN, M.D.S., F.D.S. R.C.S.
Royal Victoria Hospital, Belfast

CASE REPORT

THE patient, a man aged 51, was referred by his dentist to hospital. The complaint was of a persistent bad taste and halitosis, which had been present for some time. The patient's health was good, and there was no history of illness.

CLINICAL EXAMINATION.—Full dentures were being worn, which were well fitting and comfortable. Denture hygiene was satisfactory. A root was present in $\overline{|8}$ region. The buccal sulcus about the maxilla was deep, there being an unusually high reflection of the alveolar mucous membrane to the cheek and lip. In this sulcus in the right tuberosity region there was a deposit of food debris. This was investigated and it was found that the debris filled an invagination in the mucous membrane. This invagination extended superiorly and laterally, being approximately 1 cm. in depth, and 1 cm. in width at its opening into the mouth. It was lined with epithelium of normal appearance. There was no thickening or induration of surrounding tissues.

Fig. 1.—Section showing epithelium (E.) which lined the crypt, a germinal centre (G.C.) and about it more deeply staining lymphocytes. (× 90.)

Radiographs showed an area of rarefaction about the $\overline{|8}$ root. There was no other abnormality.

TREATMENT.—The pocket was excised under local anæsthesia, and the wound sutured. The $\overline{|8}$ root was removed. Healing was uneventful. Food debris no longer lodges in the tuberosity region, and the patient is free from the unpleasant taste and halitosis.

PATHOLOGICAL REPORT.—There is a sinus passing under the mucosa. It is lined with squamous epithelium which is rather irregular, but not neoplastic. It is surrounded by lymphadenoidal tissue rather after the manner of a tonsillar crypt, and is probably a congenital malformation.

The photomicrograph (*Fig.* 1) shows the epithelium lining the crypt, and the germinal centre surrounded by more deeply staining lymphocytes.

DISCUSSION

Cooper (1948) states that about the communication between mouth and pharynx are disposed masses of lymphoid tissue which form the "tonsillitic ring". This includes the palatine or faucial tonsils, the adenoids, and less discrete collections of lymphoid tissue embedded in the tongue, cheeks, and pharyngeal walls which comprise the lingual and buccal tonsils.

Miles (1956) uses the term "buccal tonsil" to describe a nodule of lymphatic tissue with an associated epithelial-lined crypt, which had been removed from cheek mucosa. Two explanations were put forward—either that the buccal tonsil was an ectopic fragment of lymphoid tissue, or that it developed as a new formation at a site of chronic inflammation.

Gorlin (1957) reports three cases in which nodular swellings were removed from beneath cheek mucosa near the orifice of Stenson's duct. Two proved to be essentially normal lymph-nodes, and the third was diagnosed as a lymph-node which had become the seat of a lymphoma. This lymphatic tissue was considered to be an embryological misplacement of the buccal lymph-nodes which occur superficially to the buccinator muscle.

While displaced lymph-nodes may occur in the cheek, as in the cases given by Gorlin (1957), the case described here and that by Miles (1956) both have crypts in relation to the lymphatic tissue. They could be regarded as ectopic tonsillar tissue, and are well described by the term "buccal tonsil".

SUMMARY

A buccal tonsil situated in cheek mucosa has been described. In the absence of any inflammation it seems probable that this lymphoid tissue with epithelial-lined crypt is ectopic tonsillar lymphoid tissue.

Acknowledgement.—I wish to thank Dr. J. B. Gibson for the pathological report.

REFERENCES

COOPER, E. R. A. (1948), *Human Histology*, 2nd ed., 133. London: Lewis.

GORLIN, R. J. (1957), *Oral Surg.*, **10**, 87.

MILES, A. E. W. (1956), *Dent. Practit.*, **6**, 383.

ABNORMALITY OF THE LABIAL SURFACE OF A MAXILLARY CENTRAL INCISOR

By **A. J. MacGREGOR**, B.D.S., F.D.S. R.C.S.

*Registrar, Newcastle upon Tyne Dental Hospital**

ABERRATION of the dental lamina in the maxillary incisor region is common. Extreme variations result in the formation of odontomes, geminations, and supernumerary teeth. The maxillary lateral incisor is variable in form, particularly on its palatal surface where there is a known range from the cingular pit through the cingular invagination and dens in dente to the dilated odontome. The central incisor is remarkably constant in form, and the finding of a unilateral deformity is unusual.

Fig. 1.—Pre-operative photograph showing two areas of radiopacity and numerous small radiolucent areas.

CASE REPORT

An 8-year-old boy was brought to this hospital by his mother who had noticed that the eruption of his upper left central incisor was delayed.

ON EXAMINATION.—It was seen that this tooth was partly erupted and tilted labially. The crown was markedly tritubercular, more grey in colour than its neighbours, and on both its labial and palatal surfaces hypoplastic pitting of the enamel was present. Above this tooth, on the labial mucoperiosteum, there was a bony-hard swelling which measured 1 cm. axially and 5 mm. mesiodistally. Neither the patient nor his parents had noticed the swelling and there was no pain or evidence of recent enlargement. Electric pulp tests were difficult both to perform and interpret, but the response

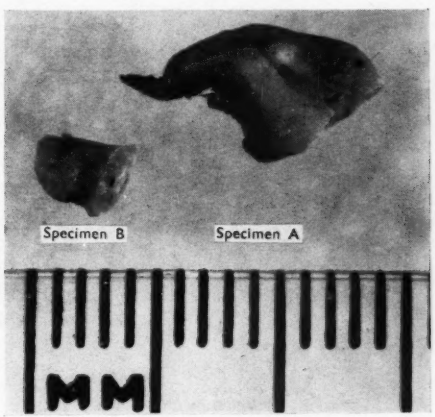

Fig. 2.—Gross appearance of resected specimens.

* Now Lecturer in Oral Surgery, Dental School, University of Leeds.

of the abnormal tooth was similar to that of the normal upper right central incisor.

X-RAY EXAMINATION.—X-ray examination (*Fig.* 1) revealed the presence of a radiopaque mass lying over the central part of the incisor crown. A similar, but smaller, configuration was seen in close relationship to the mesial cusp. Areas of radiolucency corresponding with the hypoplasia could be seen on the incisal half of the crown. The root and pulp canal were of normal shape and at an equivalent stage of development to that of the upper right central incisor.

During the elevation of a mucoperiosteal flap under local anæsthesia a small horn of hard tissue was detached from the crown (Specimen B, *Fig.* 2). Further reflection of soft tissues revealed a larger mass, which was seen to project from the middle of the tooth as a horn curving upwards and forwards to become parallel to the axial plane and tapered to a point (*Fig.* 3). It was firmly attached and it was necessary to use a bur to remove it (Specimen A, *Fig.* 2). This excision left a surface similar to porcelain at the "biscuit stage".

The soft tissues were replaced and healing was uneventful. The patient was seen 3 months later when the tooth was still vital and it could be seen to have erupted further (*Fig.* 4).

Fig. 3.—At operation; Specimen A in position; Specimen B resected.

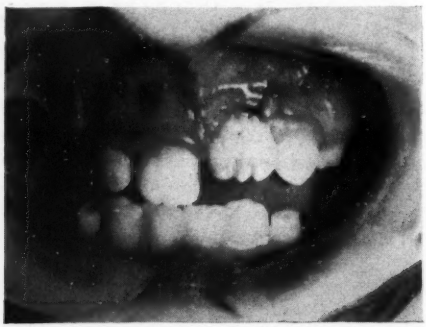

Fig. 4.—Three months post-operatively.

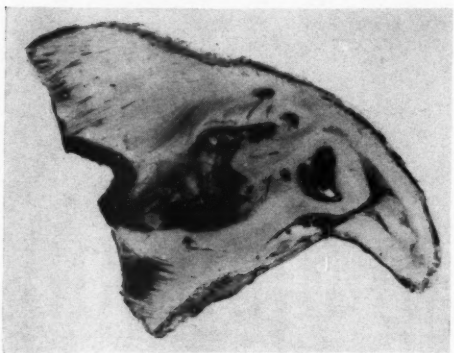

Fig. 5.—Specimen A, ground section.

Fig. 6.—Specimen B, decalcified section.

PATHOLOGY

The following Histological Report was made by Mr. H. E. Simpson.

Specimen A (*Fig.* 5).—A ground section of calcified tooth tissue 0·8×0·5 cm. The specimen is largely composed of tubular dentine and resembles in shape and general structure a resected root curved at its apical extremity. Most of the outer surface is thinly covered with cementum except along the line of section and part of the convex margin where there has been mechanical damage. Immediately adjacent to the cut surface on the convex side there is a small area of enamel.

In the centre of the cut surface there is an area of enamel apparently forming part of the wall of a cavity. From this enamel extends

irregularly two-thirds of the length of the specimen and terminates in two rounded masses, one of which contains a small cavity. Two other small cavities are present in the enamel extension and another is to be seen in a small island of enamel a short distance from the main mass.

No pulp cavity is seen, but the arrangement of the dentine suggests that there may have been a small annular one obliterated by further dentine deposition. The appearance is that of a diverticulum of enamel extending from the wider extremity of the specimen in the manner of an irregularly formed dens in dente or palatal invagination.

Specimen B Decalcified (*Fig.* 6).—This is a fragment of tooth tissue 0·3 cm. in diameter consisting of dentine covered with cementum, except along one side, which is apparently the line of excision. The fragment contains three cavities and parts of three others.

One cavity contains an area of enamel matrix and a small area of pulp-like connective tissue.

The appearance of the other cavities suggests that they were lined with enamel, and a few soft-tissue remnants are probably enamel epithelium.

This specimen resembles Specimen A, but it tends more frankly towards a complex composite odontome.

DISCUSSION

The aetiology of this malformation is a source of speculation. It is possible that it may have resulted from the fusion of odontomes adjacent to the crown of the tooth by deposition of cementum. Odontomes, when present, usually occur on the palatal side of the incisor teeth and, moreover, when teeth and odontomes are in juxtaposition they do not commonly fuse.

Colyer (1936) has suggested that such a deformity may be the result of trauma and that some ameloblasts isolated by a blow may continue to form enamel. He described incisor teeth from a bear and a baboon and states that portions of the teeth partly calcified at the time of injury show patchy hypoplasia. The roots of both teeth were stated to be fully formed, although abnormal in shape. A deformed central incisor of a Tantalus monkey is described (Colyer's Fig. 690) which bears a resemblance to the specimen reported here.

Rushton (1958) has described partial duplication of incisor teeth resulting from mechanical trauma. He notes that the enamel of that part of the crown already formed at the time of injury appears to undergo no further development and remains rough and yellow, and that sometimes the enamel is deeply pitted in a manner suggesting some resorption before eruption.

If the malformation described here is the result of trauma or infection the hypoplasia indicates that it probably took place around the time of birth. The patient's mother stated that pregnancy and birth were normal, there was no abnormality of the deciduous incisors which were shed in the normal way.

Although the boy is not a good or regular dental patient the conservative plan of treatment has been fully justified by the continued vitality of the tooth, its accelerated eruption and its action as a most efficient space maintainer.

Acknowledgements.—I wish to thank Professor G. L. Howe, Oral Surgery Department, Sutherland Dental School, for the help and advice given in the preparation of this communication; Mr .H. E. Simpson, Pathology Department, Sutherland Dental School, for the pathological report; and Mr. A. Finlayson of the Photographic Department of the Newcastle upon Tyne Dental Hospital for the illustrations.

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RUSHTON, M. A. (1958), *Brit. dent. J.*, **104**, 12.

BACK NUMBERS

The Publishers would be glad to purchase copies in good condition of Vol. IX, No. 2, October 1958.

THE ONE-POINT CONTACT CRIB

By **NORMAN ROBERTSON**, B.D.S., H.D.D., D.D.O.
Senior Registrar, Department of Orthodontics, Glasgow Dental Hospital

THESE cribs make use of the undercut areas on the buccal surfaces of molars, premolars, and canines described by Adams (1949). One-point contact cribs were evolved essentially for use in cases where the anchor teeth were not fully erupted, e.g., lower first permanent molars. While they are of particular value in the above-mentioned cases, and in the cribbing of premolars and canines, such cribs may be used to advantage in the construction of all types of appliances.

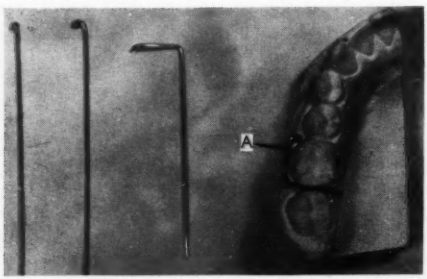
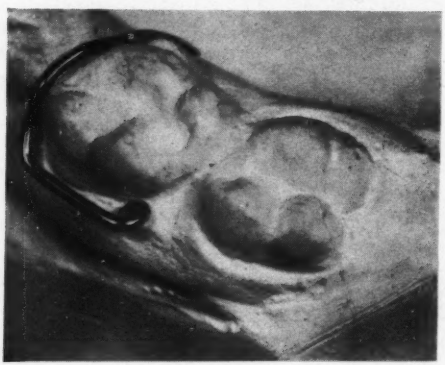


Fig. 1.—Showing details of construction of crib.



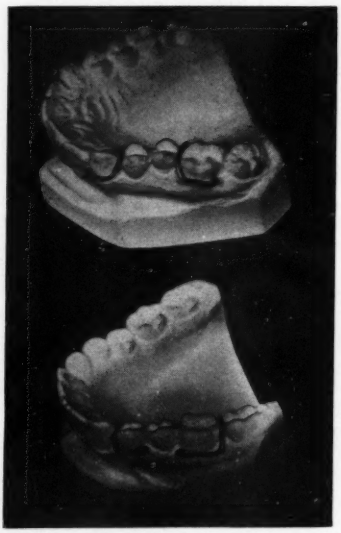


Fig. 2.—Showing cribs adapted to various teeth.

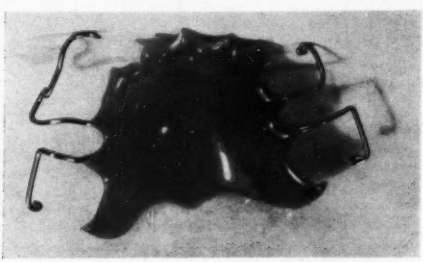


Fig. 3.—Showing completed appliance incorporating one-point contact cribs.

Construction.—Molar cribs are constructed in 0·8-mm. and premolar and canine in 0·7–0·8-mm. hard stainless steel wire, using ordinary workroom pliers. *Fig.* 1 shows details of the construction. It should be noted that, with the exception of the free end, the buccal arm of the crib lies clear of the tooth. To adjust at the chairside the crib is bent lingually at point A (*Fig.* 1). The photographs (*Fig.* 2) show examples of cribs adapted to various teeth. A completed appliance incorporating these cribs is shown in *Fig.* 3.

Advantages.—

1. Simple to construct.

2. Efficiency. Simple tests have shown, in comparison with an appliance carrying three-quarter cribs of conventional design, that an appliance fitted with one-point contact cribs requires twice the force to dislodge it.

3. Heavy gauge wire may be used in the construction.

4. Not liable to fracture.

5. Easy to adjust.

6. May be used on appliances incorporating posterior biting platforms.

7. Cleanliness.

Acknowledgements.—I wish to thank Dr. T. C. White for his encouragement and help in the production of this short paper and its illustrations and also for permission to publish. I am indebted to Messrs. Jarvie, Torrance, and Wilson, orthodontic technicians, for the construction of models and appliances.

REFERENCE

ADAMS, C. P. (1949), "Modified Arrowhead Clasp", *Trans. Brit. Soc. Orthodont.*, 50.

BOOK REVIEWS

ORAL AND DENTAL DIAGNOSIS with suggestions for treatment. By KURT H. THOMA, D.M.D., Dr. med. dent. h.c., F.D.S. R.C.S. (Eng.), Hon. F.D.S. R.C.S. (Edin.), Professor of Oral Surgery, Boston University; and HAMILTON B. G. ROBINSON, D.D.S., M.S., Dean and Professor of Oral Diagnosis and Pathology, School of Dentistry, University of Kansas City. $9\frac{1}{4} \times 6$ in. Fifth edition. Pp. 558, with 975 illustrations (25 in colour). 1960. Philadelphia and London: W. B. Saunders Co. 77s.

THE first edition of this fine book was published 26 years ago, and now a fifth edition has appeared, rejuvenated by the addition of up-to-date knowledge gleaned from the authors' own extensive clinical experience and from the recent literature. Despite the deletion of out-moded concepts, there are about 100 more pages of text in this edition.

The lay-out of the text is now more pleasing and a higher quality of paper gives improved clarity to the unique collection of clinical pictures and greater contrast to the photo-micrographs. Almost every dentist must be familiar with the format of this book, with its chapters arranged according to the regional anatomy of the mouth for quick reference.

There are 50 new illustrations, and it is interesting to note that those water colours that used to give the book a "ye olde worlde look" in places no longer appear.

Within this book the dental student practitioner, and consultant will find all that practical information so essential for the diagnosis of oral and dental disease. Besides being a credit to the authors, this new edition of their book is a major contribution to the dental literature. B. E. D. C.

HANDBOOK OF DENTAL PHARMACOLOGY AND THERAPEUTICS. By ROY GOULDING, B.Sc., M.D. (Lond.), Hon. Research Fellow in Therapeutics, Guy's Hospital Medical School, London. $7\frac{1}{4} \times 4\frac{3}{4}$ in. Pp. 199+viii. 1960. London: William Heinemann Medical Books Ltd. 15s.

THIS is a straightforward, small, useful text-book of pharmacology and therapeutics for dental students. It gives a clear account of the drugs which are likely to be used or of which knowledge may be wanted in dental practice, with sensible advice about their use. There is not much information about the methods of evaluating new drugs or how to distinguish a reliable therapeutic trial from an unrealiable one, although the author rightly recognizes the importance and dangers of newly-introduced substances. Also, there are no references to additional sources of information, except for official publications. Within these limitations, which are those of the tradition of authoritative teaching and unquestioning acceptance, this is a good book. M. W.

MEDICINE FOR DENTAL STUDENTS. By R. A. Cawson, M.B., B.D.S., F.D.S. R.C.S. (Eng.), Senior Lecturer in Oral Pathology, King's College Hospital Medical School (University of London) Dental School; and R. H. Cutforth, M.D., M.R.C.P., Physician Specialist to the North West Coast of Tasmania. $9\frac{1}{8} \times 6$ in. Pp. 212+viii, with 30 illustrations. 1960. London: J. & A. Churchill Ltd. 25s.

In order to write this book the authors have had to condense an account of general medicine into 200 pages. This has been achieved while at the same time maintaining a satisfactory prose style. On the whole the information presented to the reader is accurate, reasonably up-to-date, and remarkably balanced. An occasional error has slipped through, but these are small, and considerable care must have been taken in preparing the text.

The book has been clearly printed on good paper and is easy to read. The illustrations are clear and well chosen. There is little doubt that it will prove popular with students, especially just before examinations.

What requires to be challenged is the whole concept of this and other texts like it on general medicine and surgery. The preface says: "Most of the dental student's time is taken up in learning the many technical skills of dentistry" and ". . . medicine can form only a small part of the dental student's course". In saying this the authors do less than justice to the importance of their subject and to the latent ability of their readers.

The acquisition of technical skills does indeed absorb a considerable part of the dental student's time, but dentistry is a speciality of medicine and the principles that govern the use of their skills are the same as those that guide physicians and surgeons during their daily practice. Adequate time should therefore be devoted by the student to the study of general medicine, or he will not obtain a true perspective of his own particular field. It is the grasp of the many facets of knowledge on which his skills are founded which separates the good dentist from the competent technician.

By limiting themselves to 200 pages the authors are only able to devote 2 pages to discussion of the choice of anæsthetics for patients with serious general diseases. Both continuous anticoagulant therapy and the systemic uses of adrenal cortical steroids are mentioned in appropriate sections, but the management of patients taking such drugs while they receive dental treatment is not covered. A text-book of medicine for dental students should surely be of sufficient size to deal with these matters.

It is the reviewer's contention that a much larger book is required. "Medical" and "surgical" diseases should be dealt with together in terms of their disorders of function and structure. The unity of diagnostic methods in medicine, surgery, and dentistry should be stressed and the principles of both medical and surgical treatments should be discussed where this is appropriate. A much fuller account of the significance to the dental surgeon of certain general conditions and their treatment is also required.

G. S.

A MANUAL OF ORAL EMBRYOLOGY AND MICROSCOPIC ANATOMY. A Text-book for Students in Dental Hygiene. By Dorothy Permar, B.S., M.S., Associate Professor of Dentistry (Oral Histology and Dental Anatomy), College of Dentistry, Ohio State University, Columbus, Ohio. Second edition. 10×7 in. Pp. 121, with 59 illustrations. 1959. Philadelphia: Lea & Febiger (London: Henry Kimpton). 41s.

This book is intended for use by dental hygienists in conjunction with lectures and discussion periods, and whilst no previous instruction in histology or embryology is assumed, the book does presuppose that the student has had a course in general histology. It is assumed, therefore, that the student is already cognizant of many of the terms which are employed. The general layout is, of necessity, to some extent novel for such a book on oral histology. The introductory chapter on embryonic development is followed by one on general histology. The various oral and dental tissues are then dealt with, two

separate and final chapters being devoted to tooth development and eruption. The description of each tissue is concluded by the clinical considerations associated with that tissue. Bearing in mind the very frequent and necessary definitions of terminology, the author has succeeded in compressing a great deal of information within a relatively small book. The descriptions are easily understandable and with a view to avoiding confusion, many of the illustrations consist of diagrams rather than photomicrographs. A useful addition would perhaps have been a glossary of the more important terms used.

E. N.

PERIODONTAL THERAPY. By HENRY M. GOLDMAN, D.M.D., F.A.C.D., Professor of Stomatology and Chairman of the Department of Stomatology, Boston University School of Medicine, etc.; SAUL SCHLUGER, D.D.S., Director of Graduate Dental Education and Professor of Periodontics, University of Washington School of Dentistry, Seattle, etc.; LEWIS FOX, D.D.S., F.A.C.D., Associate Professor of Periodontology, University of Pennsylvania Graduate School of Medicine, Philadelphia, etc.; and D. WALTER COHEN, D.D.S., Associate Professor of Oral Medicine, University of Pennsylvania School of Dentistry, Philadelphia, etc. Second edition. $9\frac{7}{8} \times 6\frac{7}{8}$ in. Pp. 656, with 225 text illustrations and 117 plates. 1960. St. Louis: The C. V. Mosby Company. (London: Henry Kimpton.) £7.

ANY book which reaches the second edition in the short space of four years must be regarded as a success, and this is particularly true when the subject is limited to one aspect of a particular specialty.

The main difference between this edition and its predecessor, which was, in fact, only a division into two volumes of the book written by Dr. Goldman in 1942, is the addition of a further contributor and an increase in size.

The additional author is Dr. Walter Cohen, who has so ably co-operated with Dr. Goldman in publishing the volume, which deals with the pathology of periodontal diseases. The increase in size of almost 100 pages, and the addition of 35 illustrations and 17 plates, is accounted for by far more detailed attention to vestibular surgery and treatment of infrabony pockets, whilst greater attention has been given to certain special problems encountered in periodontal practice and to the great significance of sound treatment planning.

This book is a comprehensive work which should be owned by every periodontologist, and perusal of its contents will make many realize that teeth whose periodontal tissues are diseased need not on many occasions be sacrificed.

The standard of publication remains extremely high, and it is pleasing to note that the considerable additions have been effected without any increase in price.

A. B. W.

THE MICROBIAL FLORA OF THE MOUTH. By K. A. BISSET, D.Sc., Reader in Systematic Bacteriology, University of Birmingham; and G. H. G. DAVIS, Ph.D., External Scientific Staff, Medical Research Council, Research Fellow, University of Birmingham. $8\frac{3}{8} \times 5\frac{3}{4}$ in. Pp. 100, with 25 illustrations. 1960. London: Heywood & Co. Ltd. 22s. 6d.

THIS book gives a concise account of the systematic bacteriology of the oral flora, and a short review of the relation between this flora and dental disease. Much of the material is only available in the original papers. As many of these papers have been written by Dr. Bisset and his co-workers, it is not surprising that prominence is given to the morphology and the suggested revolutionary relationships of the various species. From the point of view of the bacteriologist it is a pity that the biochemical reactions have not been given in a statistical form. Of note also is the lack of discussion of the view that the presence of some species is determined by environment conditions, for example, the presence of teeth or the consumption of dairy products.

The authors are to be congratulated on writing an excellent manual of value to all interested in this subject.

G. C.

ABSTRACTS FROM OTHER JOURNALS

The Diagnosis of Epithelioma of the Lip

Introduction and Aetiology.—The early recognition of malignant ulcers is always important and all lip ulcers in elderly men should be suspect, especially when they occur between the midline and the commissure. Ninety per cent of carcinomata of the lip occur in men, and mostly on the lower lip. In view of the geographical distribution of persons suffering from lip cancer, the actinic rays of sunlight are put forward as a significant causative factor, and Bland Sutton called such a growth "the countryman's cancer". Long exposure to the sun is required. Bland Sutton's doubts about the clay tobacco pipe causing cancer were confirmed by the statistics of Crile and of Broders. Wyburn-Mason (*Brit. med. J.*, 1957, **2**, 615) indicates a connexion between herpes simplex and lip cancer. Syphilis, nowadays, tends to be discounted as a cause, and it is also unlikely that the teeth can have any influence on the initiation of growths in the situation on the lower lip where cancer arises. Hyperkeratosis, leucoplakia, cracks and fissures of the lip are not merely causative factors but are definite, pre-malignant conditions.

Clinical Features.—These pre-malignant conditions are to be regarded seriously and sections taken. Hyperkeratosis may be identified by the heaping up of the epithelium on the lip in small circumscribed warty nodules; they are golden yellow and translucent. In leucoplakia part of the lip appears to be splashed with white paint, and the remainder may appear normal or it may be fiery-red owing to the atrophic cheilitis. Cracks and fissures may be present, and any which do not heal in four weeks should be examined histologically.

The established carcinoma may be nodular, an exuberant proliferative growth, or a crusted ulcer or fissure which is eroding down into the lip. But on close inspection there will be the usual rolled hard edge. It may be tender to touch, the colour variable, and there is alternate bleeding and crusting. The ulcer tends to spread along the lip and not to cross the vermilion margin, but soon it will spread across the cheek. Glandular involvement is seldom found early, but when it does occur it complicates the treatment. A biopsy should be taken in all cases of doubt and the picture seen will vary widely from well-differentiated growths with many cell-nests to rapidly growing, widely infiltrating tumours. Cases in which mitosis is a very obvious feature will be rapid in growth.

Treatment.—The primary lesion may be treated by surgery and radiotherapy with comparable results. The secondary deposits in cervical lymph-nodes are not amenable to irradiation, and are treated by surgery. Treatment by radium has now almost given way to the use of X rays and to a dose-level of 3000–5000 roentgen units, depending upon the degree of invasion of the lip. Surgery is still a valuable means of treatment, however, for by it the whole of the exposed and metastable area of the lip may be removed at the same time. Secondary deposits are usually first seen in the submandibular nodes and later in the jugulo-digastric node and then in the whole jugular chain.—ALLCOCK, E. (1960), *Aust. dent. J.*, **5**, 28. G. E. B. MOORE

Die Vitaberhaltung der Pulpa

Conservation of pulpal vitality requires accurate diagnosis of the state of the pulp and careful treatment.

Szemer (1950) recommends the treatment of non-purulent pulpitis due to caries by chloroform locally applied if the pulp still possesses a vital reaction and if the tooth is barely tender to percussion.

After removal of soft caries, a pledget soaked in chloroform is placed in the cavity and is covered by a temporary seal. This is twice renewed at two-day intervals. The cavity is then prepared using cold water spray and minimal pressure. A sub-base of definitive dressing is placed on the pulpal wound under a zinc phosphate cement lining.—RENNIE, K. H. (1960), *Zahnärztl. Prax.*, **11**, 5.

M. PLEET

THE ROUND-WIRE MULTIBAND APPLIANCE

By C. P. BRIGGS, B.D.S., F.D.S., D.D.O., D.Orth.
Royal Dental Hospital of London

IN presenting this demonstration no claims to original work are made, and those interested are referred to papers by Hill (1954a, b) and Begg (1954, 1956). It was felt, however, that various features of technique which have evolved in the past few years in the Orthodontic Department of the Royal Dental Hospital would be of interest to the Society.

Fig. 1.—Elastic inter-arch traction, retracting upper canine and using teeth posterior to extraction space in the lower arch as anchorage.

Fig. 2.—Inter- and intra-arch traction proceeding simultaneously.

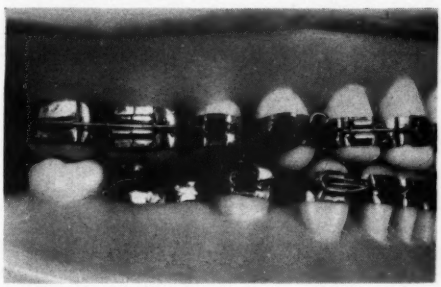


Fig. 3.—Inter-arch traction retracting upper incisors and closing residual extraction space in the lower arch.

Fig. 4.—"Kick out" bends medial to canines.

Taking a typical Angle Class II, division 1 case as an example, the technique consists first of a full band up after the extraction of all four first premolars, followed by the fitting of a light alining arch. This has usually been of 0·018 in. high-tensile wire, but now, as better wire is becoming available, light arches of 0·014 in. are fitted. The purpose of this arch is to aline the band brackets, so that heavier arches, fitted later, are able to slide freely along the buccal segments.

With a case not showing too severe imbrication, this fine arch may be replaced with a 0·020 in. working arch, or a 0·018 in. high-tensile arch if of sufficient hardness, within 2 or 3 weeks. The thinner arch is preferable, as frictional resistance in the buccal tubes is reduced.

Elastic bands are fitted to retract the upper canines, using inter-arch traction. The teeth posterior to the extraction space in the lower arch are used as anchorage for this movement (*Fig.* 1).

Intra-arch traction in the lower arch to retract crowded canines is often desirable (*Fig.* 2); this may also be used to prevent

A demonstration given at the meeting held on May 9, 1960.

proclination of the lower incisors out of muscle balance. In this instance, traction loops are incorporated in the arch wire medial to the canines.

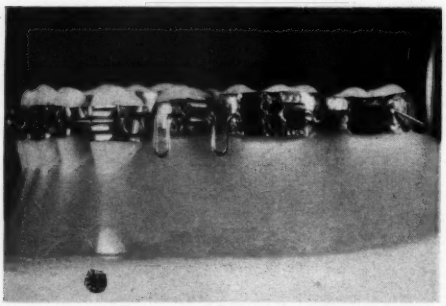


Fig. 5.—"Third-power" bends increasing local flexibility and allowing alinement of premolar.

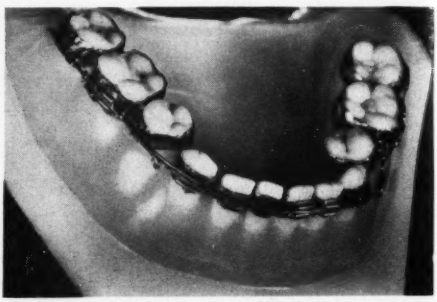


Fig. 6.—"Whip", constructed of 0·018 in. high-tensile steel placed in tie bracket of lower right premolar and hooked on to main arch in incisor region.

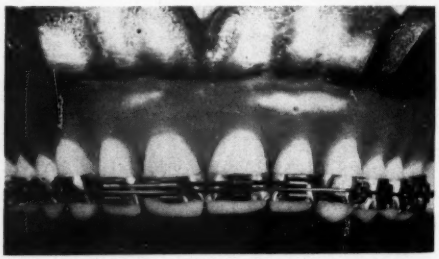


Fig. 7.—Accessory arch in tie brackets achieving final alinement of incisors.

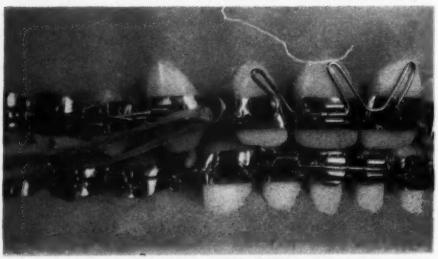


Fig. 8.—"Begg" type arch with gingival loops.

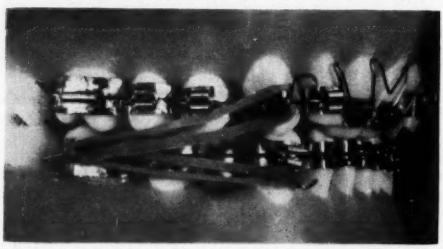


Fig. 9.—Inter- and intra-arch traction on "Begg" type arch.

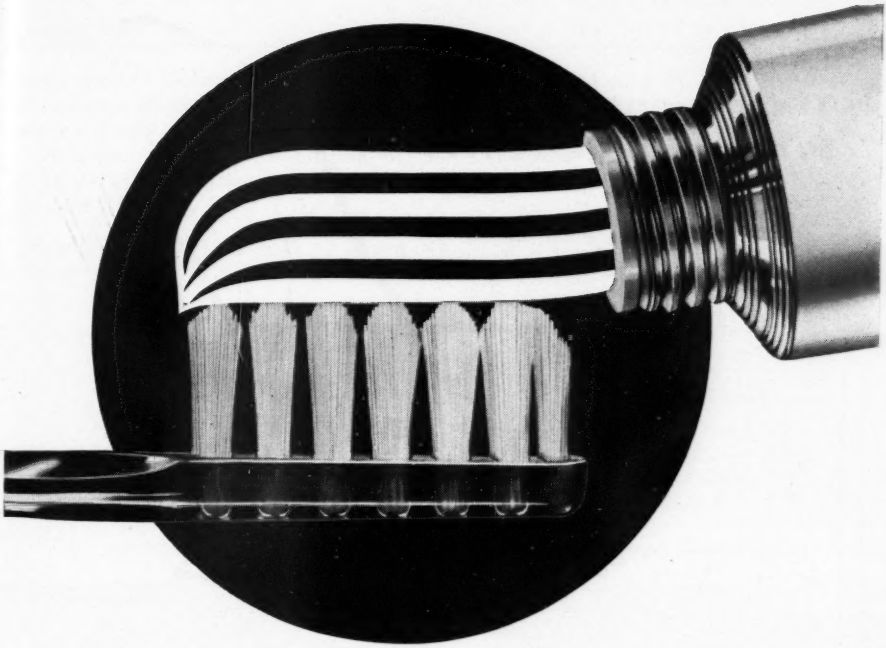
Following retraction of the canines, the upper incisors are themselves retracted by means of an upper arch sliding freely in the buccal segment (*Fig.* 3). The importance of a "kick out" bend medial to the canine (*Fig.* 4) to allow for this movement is emphasized.

Final alinement is achieved by tightly ligating the brackets to a 0·022 in. final arch bent up to ideal arch shape.

Various accessories and modifications are in common use, and some are shown. Where it is desired to move teeth across the line of the arch, to correct a minor rotation, or to achieve a depression, "third-power" bends are incorporated in the main arch wire (*Fig.* 5). For the correction of more severe rotations, a "whip" in 0·018 in. wire is suitable (*Fig.* 6).

To achieve a final alinement of root apices, accessory arches of successively increasing diameter may be inserted into the tie brackets (*Fig.* 7).

In treating a Class II, division 2, where palatal movement of upper incisor apices is desired, a "Begg" type arch is fitted. This arch has loops which extend apically from the bracket to impinge on the tooth in the region of the gingival margin (*Fig.* 8). These loops are activated by closing up the traction loop in the



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canine region. Inter-arch traction (*Fig.* 9) is an essential feature of this appliance, and extra-oral anchorage to reinforce at night time is desirable, otherwise proclination of the incisor crown, rather than retroclination of the apices, will occur.

Acknowledgements.—I wish to thank my colleagues in the Orthodontic Department of the Royal Dental Hospital for their advice and assistance in preparing this demonstration, and Messrs. E. D. McBride and J. Shilland for models and photographs.

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— — (1956), *Ibid.*, **42**, 481.

SOME ORTHODONTIC SPRINGS

By **P. H. BURKE**, B.D.S., H.D.D., D.D.O.

CANINE RETRACTION SPRING

THIS spring is particularly indicated for the retraction and alinement of buccally displaced maxillary and mandibular canine teeth (*Fig.* 1). It is mounted in a modified "U-loop" on a labial bow by wrapping only (*a*). The spring is essentially an auxiliary finger spring (with loop) attached to a labial bow which can be displaced distally to supplement the normal range of action of a finger spring. The distal displacement is achieved by extending the five or six loosely wound loops on the horizontal bar of the "U-loop" of the labial bow (*b*). The spring is extended to engage the mesial surface as its point of application, and its action is guided by a loosely wound runner (*c*). This is also a safeguard should the spring break. The range of the runner is increased by the mesial tilt of the distal arm of the "U-loop" in the labial bow (*d*). Stainless steel wire of 0·45 mm. diameter provides a suitable force for tooth movement. Although buccal displacement furnishes an easy point of application for the spring on the flat mesial surface of the canine tooth, it can be used to retract teeth in alinement and teeth other than canines (*Figs.* 2, 3).

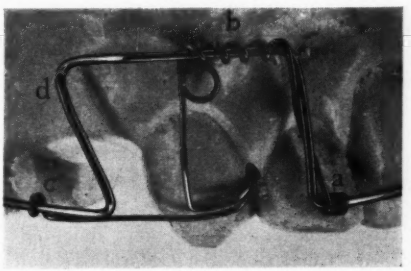

Fig. 1.—Canine retraction spring.

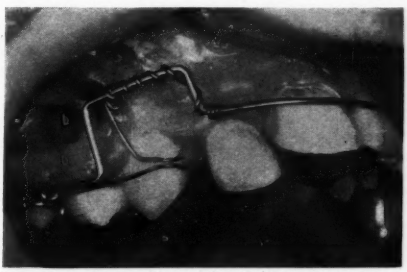

Fig. 2.—Spring in use retracting and alining maxillary canine.

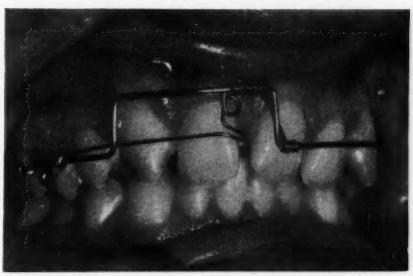

Fig. 3.—Spring moving a central incisor distally.

A demonstration given at the meeting held on May 9, 1960.

DOUBLE FINGER SPRING

In cleft palate patients access to the palatal surface of incisor teeth in linguocclusion may be difficult. This is particularly so when there has been medial collapse of the buccal segment, which now comes to lie directly palatal to the incisor adjacent to the cleft. A "boxed-in" finger spring attached away from the area of collapse is the obvious solution. A double boxed-in finger spring with loops gives security should the wire break, and favours the use of thinner wire with a smooth spring-end to help access. The loops are staggered for easy adjustment and the spring may have to be "cranked" more than is shown in the illustrated appliance (*Fig.* 4). Again 0·45 mm. stainless steel wire is used. Since the incisor adjacent to an alveolar cleft is often hypoplastic, strict attention should be paid to oral hygiene, particularly on the palatal aspect, when this spring is used.

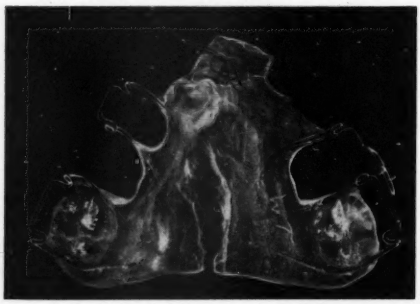

Fig. 4.—Double finger spring to procline central incisor.

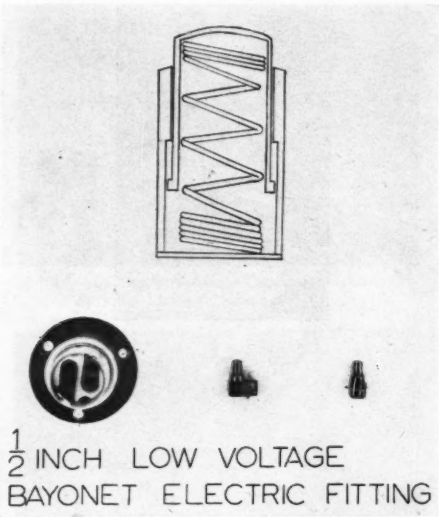

Fig. 5.—Plan of spring plunger.

SPRING PLUNGER

The virtue of the coil spring is maximal range of action with minimal bulk. This spring may be used to procline an incisor in the form of a spring plunger (*Fig.* 5). A source of ready-made brass spring plungers is the standard half-inch low-voltage bayonet electric light fitting. After extracting the spring plunger from the fitting, the heavy coil spring is removed by drilling through the base. A suitable orthodontic coil spring in 0·015 or 0·02 mm. stainless steel wire is then inserted and a new brass base is secured using soft solder. The bulk of the base is reduced as much as possible leaving a small flange to prevent rotation when the spring plunger is attached to a suitable orthodontic appliance using quick setting acrylic resin (*Fig.* 6).

Acknowledgements.—I am indebted to Mr. J. Curran, Senior Dental Technician, Newcastle upon Tyne Dental Hospital, for his help in preparing some of the material for this demonstration. My thanks are also due to the Photographic Department of the Newcastle upon Tyne Dental Hospital for the care taken in producing the illustrations.

Fig. 6.—Removable appliance carrying spring plunger to procline a central incisor.

THREE CASES SHOWING MARKED INCREASE IN MALOCCLUSION IN THE MAXILLARY INCISOR REGION

By LILAH M. CLINCH, M.A., F.D.S., D.Orth. R.C.S.

THE following cases may explain why an occasional patient does not respond to orthodontic treatment as the majority do; the development is becoming more unfavourable although there is no obvious reason to explain this sudden change for the worse. If appliances were fitted they would not only be correcting the malocclusion which is present, but also they would be battling against an unusual degree of lack of growth in one area in particular. All the children were healthy, well-grown girls whose medical history was good. One was a case which was under observation annually since 4 years of age; the other two were noticed by chance, as they were examined and impressions for reference models were taken, and then for family reasons they were not brought back for further treatment for about 2 years. The change for the worse during that period was so striking that it was difficult to believe that they were the same children. However, the rugæ formation, which appears to be like fingerprints and different in each individual, confirmed that the original models did belong to these patients.

The first illustration (*Fig.* 1) shows a case of good development of the dental arches over the same age period, that is, from the mixed to the permanent dentition. The contour of the alveolar bone in the maxillary incisor region remains full and the labial inclination of the teeth has altered very little, if at all. Forward and downward movement of the dental arch has taken place and the bone deposition anterior to the incisor roots has kept pace with this alteration in the arch position. The maxillary intercanine breadth at the lingual gum margin is 0·4 mm. less in the permanent dentition, due to the greater labiolingual thickness of the permanent canine; but the intercanine measurement taken from the point of the cusps is 1·5 mm. greater in the permanent arch.

The three following cases developed very differently.

CASE REPORTS

Case 1 (*Fig.* 2).—First models were taken at 8 years 6 months. These show a well-formed maxillary arch, with a reasonable contour of the alveolus in the incisor area and no appreciable labial inclination of the incisor teeth. The second models were taken at 11 years 4 months. Four first premolars had been extracted 2 months previously. There has been a marked increase in the labial inclination of the maxillary incisors and an apparent hollowing over their roots. The occlusal views show the alteration in the conformation of the maxillary arch. It was not possible to measure the intercanine breadth accurately in the second model as one of the teeth had not fully erupted, but it is obvious that the arch has narrowed. The medical history during the period covered by the models showed that the child had had mumps during her eighth year and had had two attacks of tonsillitis. (The tonsils, however, were not removed.)

Case 2 (*Fig.* 3).—First models were taken at 9 years 8 months. These show a subnormal maxillary arch with medial drift and rotation of the first permanent molars after premature loss of the deciduous molars; there is a slight labial inclination of the central incisors, but the contour of the alveolus over the roots of the incisors is well formed. The second models were taken at 12 years 4 months; the maxillary first premolars had been extracted one month previously. There has been a marked increase in the labial inclination of the maxillary incisors and an apparent hollowing of the alveolus over the roots of these teeth. The occlusal views show the increase in imbrication in the maxillary incisor area. The intercanine breadth at the gum margin decreased by 1·3 mm., and the increase between the points of the cusps was only 0·2 mm. The medical history during the period showed no illnesses except occasional head colds and one severe attack of influenza.

Case 3 (*Fig.* 4).—First models were taken at 4 years. These show reasonably well-formed arches, with a tendency to postnormal occlusion of the mandibular arch. There is well-developed alveolar bone in the maxillary incisor region. The second models were taken at 9 years and show a mesial drift of the upper left first molar after the loss of deciduous molars. There is very slight imbrication of the incisors, but the teeth are upright on the alveolus. The third models were taken at 13 years. The maxillary first premolars and the mandibular left second premolar were extracted nearly 2 years previously. Despite this, a marked hollowness

Given at the meeting held on October 10, 1960.

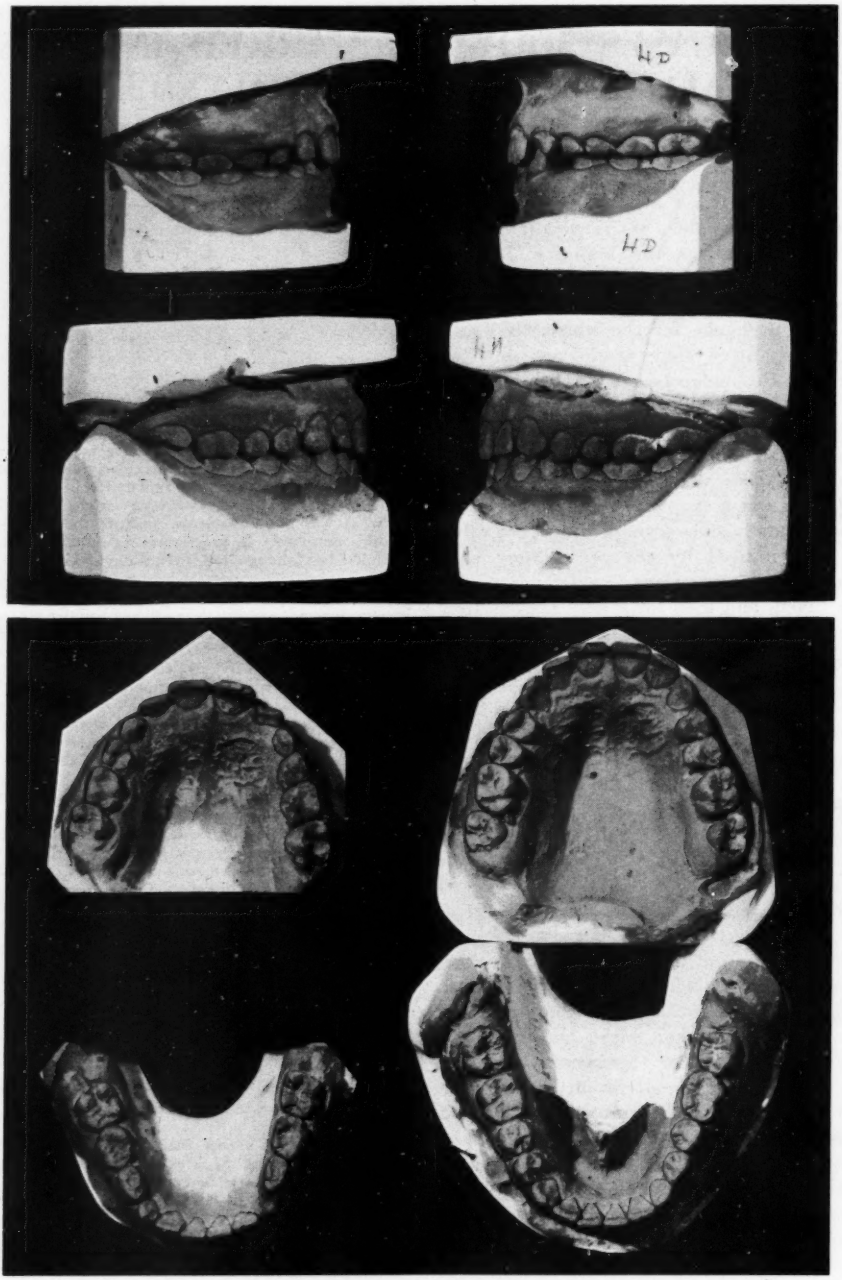

Fig. 1.—Models of good development at 9 and 13 years of age. Side and occlusal views.

has developed in the region of the maxillary incisor roots and the crowding of these teeth has increased considerably. The occlusal views show the increase in crowding of the teeth. In the first models there is slight spacing in the maxilla between the lateral incisors and the canines and also distal to the canines. The second models show only a slight imbrication of the maxillary incisors apart from the loss of space after premature extractions. The third models show an increased imbrication and rotation of the incisors despite the fact that the first premolars had been removed nearly 2 years previously. The intercanine breadth at the gum margin

Fig. 2.—*Case* 1. Models at 8 years 6 months and at 11 years 4 months. Side and occlusal views.

increased between the first and second models by 2·8 mm., but decreased between the second and third models by 1·4 mm. The medical history was good and the only illness between 9 and 13 years was measles at 10 years. This girl, however, differed from the other two by growing very tall and at 13 years her height was 5 ft. 6¾ in.

CONCLUSIONS

None of these children had any sucking habits or habits of tongue or lips which could account even for the alteration in the inclination of the teeth; in any case, the results of these habits, if they were to become apparent, should have done so when the incisors were erupting and not entirely later.

Nothing could be found in the literature showing similar maldevelopment at this late stage. The only explanation which can be suggested is that the downward and forward migration of the dental arch has continued,

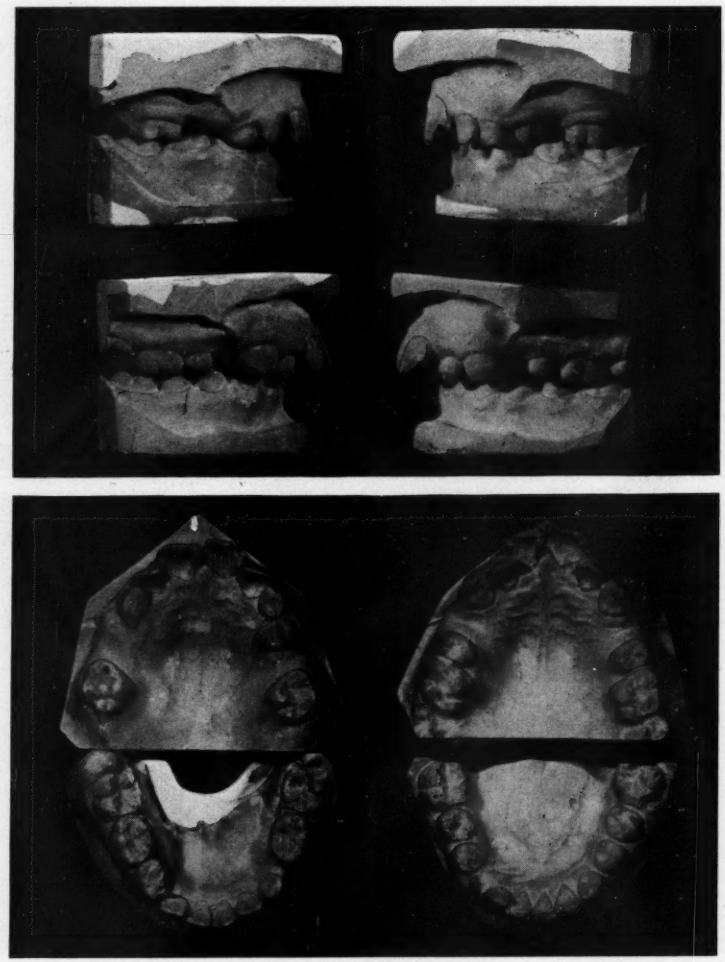

Fig. 3.—*Case* 2. Models at 9 years 8 months and at 12 years 4 months.

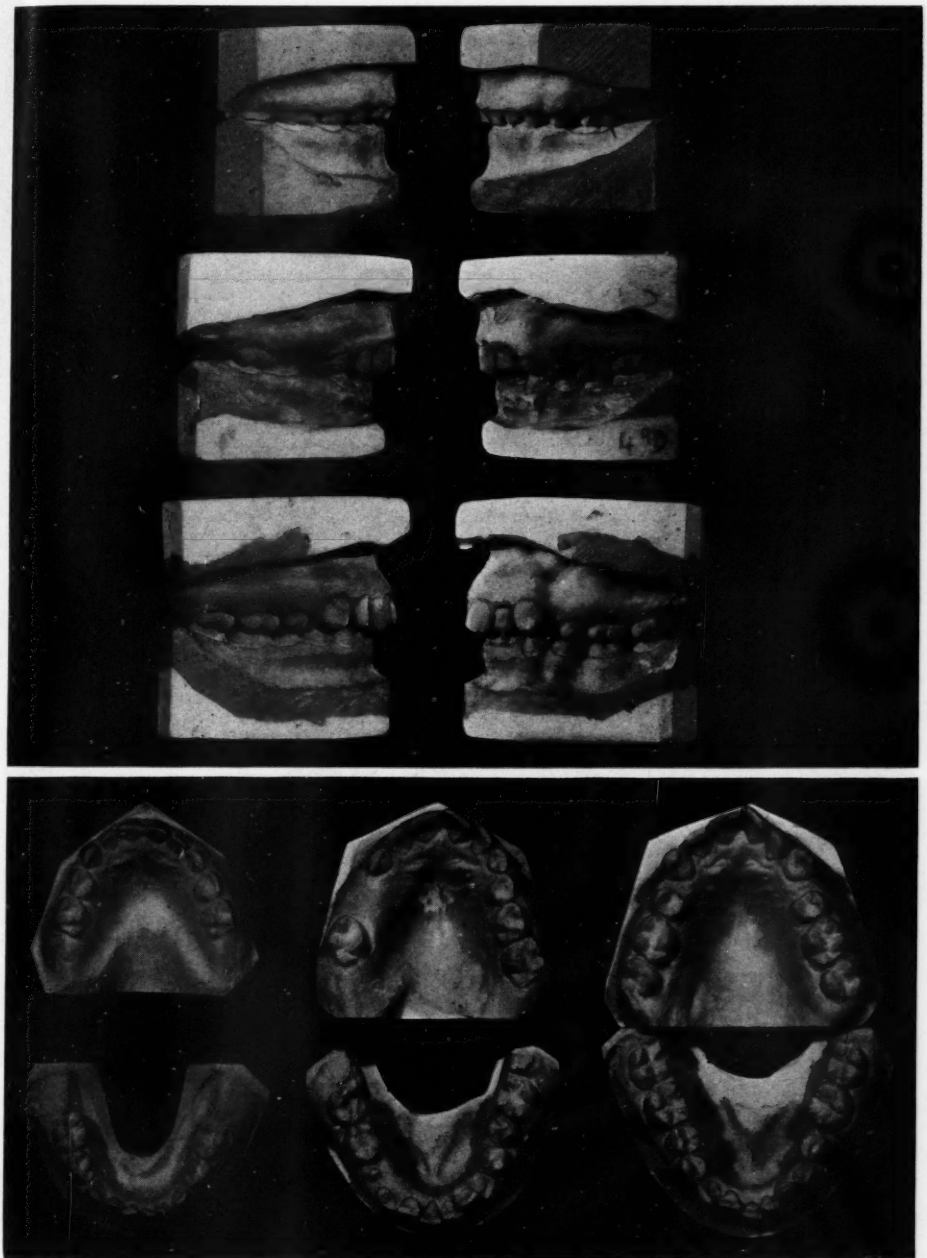

Fig. 4.—*Case* 3. Models at 4 years, 9 years, and 13 years. Side and occlusal views.

but that in these children there has been a relatively small amount of bone deposition in the area of the maxillary incisors particularly, and this has resulted in the first two cases in an increase in labial tilting of the teeth and in the third case in a marked increase of imbrication. Scott has stated that in the facial skeleton, after 7 years of age, growth by surface deposition and absorption of bone is predominant in the development of the face, and it is at this stage that these children showed such rapid increase in the degree of their malocclusion.

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SCOTT, J. H. (1948), *Trans. Brit. Soc. Orthodont.*, 71.

DISCUSSION

Mr. E. K. Breakspear asked whether Miss Clinch had any record of whether any of the cases were left-handed or right-handed?

Miss Clinch replied that she had no record of those particular cases. She had kept information concerning right- or left-handedness for quite a long time with many of her cases, but it had not seemed relevant, so she had ceased to do it.

Mr. D. T. Hartley said that Miss Clinch had referred to an increase in the hollowing of the alveolar process over the maxillary incisors as the patients got older. It seemed to him that there was simply an increase in labial tilt of the incisors and that the hollowing was purely relative. Had Miss Clinch any measurements to support her observation?

Miss Clinch replied that she did not think the hollowness could be measured. Possibly the illustrations might show it more clearly than the slides. If Mr. Hartley had seen the models, he would have no doubt about it. With regard to the roots of the teeth, one almost felt that there was no bone on the labial aspect of the roots at all; one could get a tilting of the teeth without having that apparent lack of bone in that area. One could get tilting of the teeth round the area of the gum margin in which case the roots might actually move lingually. In these particular cases, it seemed that the incisors had to move forward with the arch but there was the minimum of bone deposition in their labial surfaces.

Mr. W. J. Tulley asked Miss Clinch about the shape of the lips and their position at rest and in function.

Miss Clinch said that the first time she had seen the children, she had made the usual note about lip position. In all of them the lips were together at rest. By the time she saw them again, it was quite obviously becoming extremely difficult for the children to keep the lips together. That applied in the first two cases, but not the third. In the third, the lips were together even when the last model was made. In the other two cases, the upper incisors were apparently resting on the lower lip, but it had seemed to her that this was due to the new position of the teeth. The lips could not accommodate them in their new position.

Another speaker asked whether the lower lip actually covered the upper part of the upper anteriors.

Miss Clinch replied that when she first saw the children the lower lip was above the tips of the upper incisors. That was one of the things she always made a note of. When she first saw these cases, she simply made her regular routine check of them. She had not known that anything peculiar was going to happen to them afterwards or that the malocclusions were going to get much worse.

She had the records made at that time about lip position and from them it would seem, to her at any rate, that the lips were in a perfectly favourable position. They were together at rest and there was no strain, and they were together with the lower lip up above the tips of the upper incisors.

The President thanked Miss Clinch for bringing the cases to their notice.

Central Fibroma of Mandible

In February, 1957, a 14-year-old white girl reported with slight tenderness of the right side of the mandible and paræsthesia of the lip, but no history of trauma or pain. Radiographs showed a radiolucent lesion below $\overline{876}|$. The picture was of an irregular mottling, with an ill-defined margin and resorption of the roots of $\overline{6}|$.

Excisional biopsy was performed. Histologically the tumour was fairly cellular with tangled bundles of mature collagen between the cells. In places the lesion was myxomatous and elsewhere osteoid and bone were being formed. In one place it was invading muscle. However, the cells were fairly uniform with vesicular nuclei; there was little pleomorphism and no mitoses to be seen.

The lesion was felt to be malignant and locally invasive. However, on reviewing the patient's condition she was found to be well, with no palpable nodes and a normal healing wound. After considerable discussion it was felt that the lesion was a central fibroma rather than a low-grade sarcoma, and that an origin from odontogenic mesenchyme might account for its cellularity.

The patient was seen regularly for 3 years with no evidence of recurrence. The mandibular cavity filled in with bone.—BURCH, R. J., and WOODWARD, H. W. (1960), *J. oral Surg.*, **18**, 432. G. R. SEWARD